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MultiCam® Laser User Manual

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Read this manual before using this product.

Failure to follow the instructions and safety precautions in this manual can result in serious injury or death.

Keep this manual in a safe location.

Original Instructions

(a) The business name and full address of the manufacturer and of the authorized representative is as follows:

MultiCam Inc
1025 W Royal Ln
DFW Airport TX 75261

Erik Ketele
Ketele NV
Mechelsesteenweg, 1-3
2540 Hove
BELGIUM

(b) The machinery is designated as Laser 2000 Series.

(c) The EC declaration of conformity is attached.

(d) The above CNC machine is designed to modify raw materials that can be used in manufacturing.

(e) The maintenance and repair information is attached.

(f) The workstation likely to be occupied by the operator is a warehouse-like area with high ceilings and heavy flooring and approximately 36” (914.4mm) between the edges of the machine and any auxiliary units appropriate in a warehouse-like area.

(g) The machinery will be used to modify raw materials that can be used in manufacturing.

(h) WARNING: The CNC machine should not be used as a table or desk, heater, ladder, washing station, or prank item as the machine has the ability to crush body parts and materials and can cause serious bodily damage up to and including possible death.

(i) The assembly, installation, and connection information is attached.

(j) The information relating to reducing noise and vibration is attached.

(k) The technician performing the installation will follow an installation checklist as well as an instruction checklist for training operators. This information is attached.

(l) The residual risks inherent in the CNC machine are operator-specific and can include cuts, scratches, burns, amputations, and death resulting from non-adherence to the warning labels placed on the machine and operator-specific association and experience working with CNC machinery.

(m) The protective measures to be adopted by the user include clothing that is not loose or long; minimal to no jewelry and no long-hanging accessories or wardrobe-specific materials; protective eye wear and ear wear; long hair restrained; gloves or comparable hand-covering when handling sharp or hot parts; avoidance of alcohol, drugs, or any other substance that may decrease judgment or alertness; adherence to warning labels placed on the machine as well as operator-specific association and experience working with CNC machinery; avoidance of

placing hands on the tabletop during the cutting sequence; and observance of proper lock-out procedures when completing any maintenance or other work on the machine.

(n) The essential characteristics of the tools are sharp points and sides, blunt edges, dense material, and heavy components.

(o) The conditions that allow the machine to meet the requirement of safety during use, transportation, assembly, and dismantling when out of service, testing, or foreseeable breakdowns are the solid base on which the machine is built, the covers over moving parts, the packaging for shipment, the possible requirement of a crane or forklift to move such pieces as the gantry, the lock-out procedure if followed correctly, optional safety mat and light curtain devices that will halt the motion of the machine, and the automatic stop of all forward motion in the event of a fault.

(p) The instructions for ensuring safe transport, handling, and storage operations include the customer hiring a rigger to facilitate moving the machine; the use of a forklift or crane to move the machine from the delivery van or truck to the final location; a complete inspection of packaged parts to be completed by the installation technician and the customer; information regarding any shipping damages reported immediately to the carrier; insertion of leveling feet so that the machine is at the lowest level possible; and secure anchoring of the machine components to the floor with adequate space for ventilation.

(q) The operating method to be followed if the machine is involved in an accident or breakdown includes the operator or installation technician securing the work area so that the installation technician may determine the cause of the malfunction and troubleshoot a possible workable solution. If a blockage is likely to occur, then the operator or installation technician will halt any forward motion until it is determined that the blockage can be prevented.

(r) The adjustment and maintenance information, as well as the preventive maintenance measures to be observed are as follows:

Safety glasses and hearing protection **should be worn at all times** while operating the machine, and long hair should be **restrained with a cap or net** when near the machines. Operators should never leave the machine unattended during the cutting sequence, and labels should be observed at all times.

All machines should be kept clean when not in use. The build-up of chips and dust on the system should be cleared daily with special attention focused on the gear rack and bearing rails.

All of the bearings should be greased at least twice a month based on an 8-hour work day. The bearings should be greased more often if the machine is in use more than 8 hours a day.

The Lead Screw Z-axis should be lubricated with a non-aerosol, silicon-based lubricant. Operators are cautioned **against** using the lithium grease provided by ***MultiCam*** when lubricating Lead Screws as this may lead to premature wear of the Lead Screw. Ball Screws, however, can be lubricated with lithium grease.

The filters on the electronics enclosure and vacuum pump should also be cleaned.

(s) The instruction designed to enable safely completed adjustment and maintenance, as well as the protective measures to be taken, is as follows:

The ***MultiCam*** CNC machine will provide years of productive service if it is maintained properly. There are daily, weekly, monthly, quarterly, and yearly maintenance steps required for each machine based on a 40-hour work week. ***MultiCam*** recommends that any system used in excess of 40 hours a week should have the maintenance schedule adjusted accordingly.

Daily

The ***MultiCam*** CNC machine should be cleaned off each day, and the water lines should be inspected. All chips should be blown or vacuumed off the machine. Close attention should be paid to the rack area since chip build-up in the rack can cause stalling problems. Customers who operate systems with a Lead Screw Z-axis should lubricate the screw with a non-aerosol, silicon-based lubricant. Operators should **not** use WD-40 on the Z-axis screw for lubrication. Using anything other than what is recommended will result in the premature wear of the Z-axis screw. With Ball Screw systems, oil or lithium grease is an acceptable lubricant.

Weekly

The ***MultiCam*** CNC machine should be cleaned thoroughly each week. The filter on the control box should be vacuumed. Any build-up in the racks or rails should be blown out. The filter or filters on the vacuum hold-down systems should be removed and cleaned. All oil levels (if applicable) in the vacuum hold-down system should be checked and filled if needed. On MG Series routing systems, the Y-axis Ball Screw should also be lubricated with oil or lithium grease. MT Series routing systems will need to follow this procedure for the X-axis Ball Screw as well.

Some older routing systems use a Lead Screw on the X- and Y-axes. These systems should be lubricated with a non-aerosol, silicon-based lubricant. Using anything other than what is recommended may lead to premature wear of the Lead Screw.

Bi-Monthly

Operators should grease all the linear bearing cars at least twice a month for the ***MultiCam*** CNC machine. Jogging the machine while applying slight pressure in the opposite direction will help force the grease into the bearing cars and incorporate the grease throughout all of the bearings.

Monthly

The racks, Y- and Z-axes screws, and X-axis screws on the MT Series routing system should be cleaned with a scrub brush and degreaser once a month following the same lubrication procedure described earlier in addition to the daily and weekly cleaning for all ***MultiCam*** CNC machines. Once the racks are clean, operators should apply a bead of the lithium-based grease.

Quarterly

The X- and Y-axes covers should be removed from the ***MultiCam*** CNC machine every three months so that operators can inspect the transmission or gearboxes for wear. Operators can engage the pinion all the way into

the rack by loosening the mounting bolts of the transmission or gearbox and pushing the assembly up. The tabletop bolts should be checked to ensure they are all tight. Filters in the electrical cabinet should be cleaned.

Bi-Annually

The electrical cabinet should be checked during the bi-annual maintenance performed on the ***MultiCam*** CNC machine. Operators should turn off the power before opening the cabinet and then vacuum out any debris that may have entered the cabinet during regular working conditions. Operators should not use compressed air when cleaning out the cabinet as this action may cause unwanted particles to short out some of the electrical components.

MultiCam recommends that the belts on all transmissions and Lead Screw Z-nuts be replaced every other year.

(t) The specifications of spare parts to be used that may affect the health and safety of operators are attached.

(u) The information on airborne noise emissions is attached.

(v) The machinery is likely to emit non-ionizing radiation that may cause harm to persons, in particular persons with active or non-active implantable medical devices, in these places. The information regarding the radiation emitted for the operator and exposed persons is attached.

Installation Checklist

These machine installation procedures should be followed in order by a ***MultiCam*** Technician, and the CNC machine should be fully functional at the end of the installation. Three asterisks (***) indicate optional steps that may not be applicable to all CNC machines.

Receiving Preparation

☐	1. Machine unpacked & inventoried (suggest customer take digital pictures)	☐	6. Ethernet communication cable run
☐	2. Shipping damage claimed & replacement parts ordered if any	☐	7. Air pressure to machine must be checked. Incoming Air Pressure _____
☐	3. Machine & fume extraction units in final location w/proper space requirements	☐	8. Fume extraction provided ***
☐	4. Leveling feet on	☐	9. Computer provided
☐	5. Proper electrical to disconnect switch from disconnect box on machine, fume extraction unit, & auxiliary units	☐	10. Process gases, consumables, & materials for training with & 3/8 airline hoses

Mechanical Installation: PHASE I

☐	1. Level table (as low as possible).	☐	5. Re-adjust belts (if necessary).
☐	2. Remove all axis covers.	☐	6. Install the pendant to the control box.
☐	3. Reseat the X-axis motor assemblies in the rack.	☐	7. Slightly loosen the bolts connecting the X castings to the gantry.
☐	4. Connect the motor connectors for XA, XB, Y, and Z to the control box.		

Electrical Installation

Make sure the voltage setting is close to 40Vdc without going over.

☐	1. Measure the incoming voltage at C/B with wires 100/L1 and 102/L3.	☐	6. Check the AC voltage at pins 23 & 24 for approximately 26-28Vac for MD4 and approximately 53-55Vac for HP4. If the level is too high, power down to adjust the transformer.
☐	2. Adjust the transformer with the power OFF. Move wire 112 to matching incoming voltage at locations 210, 220, 230, or 240.	☐	7. Power down and attach. Connector N back to the controller box.
☐	3. Check for loose/disconnected wires (including gantry head and spindle box) with the power OFF.	☐	8. Power up the machine.
☐	4. Disconnect the Connector N from the top of the silver controller box inside the cabinet with the power OFF.	☐	9. Adjust the transformer and try again if the voltage is too high and an error message shows on the keypad.
☐	5. Turn the circuit breaker ON and OFF.	☐	10. Check the voltage at the keypad by pressing Shift, Help, and Six. Refer to the Schematics and adjust the transformer if necessary.

Voltage Chart

Incoming at Switch (L1,L2,L3) _____

Transformed Power (Pins 23&24) _____

Mechanical Installation: PHASE II

Electricity is required.

- ☐ **Slightly loosen gantry bolts** – Loosen both sides of the X-axis (moving gantry only).
- ☐ **Hard Home** – If machine will not find limits, then see Help Docs.
- ☐ **Verify Resolutions** – See Help Docs for more information on how to check resolution
- ☐ **Verify Table Parameters** – Jog the full distance in X-, Y-, & Z-axes. Make sure that the gantry & head do not make physical contact with the end stops.
- ☐ **Verify the cutting head is parallel to the table**.
- ☐ **Square Table** – Use a pen taped to the side of the head to make 4 points to verify the square of the gantry. The bigger the perfect rectangle or square, the more accurate.
- ☐ **Tighten Gantry Bolts** – Tighten both sides of the X-axis (moving gantry only).

Suite4 Machine Software Installation

☐	**Reboot Machine** – Check for red letter errors.
☐	**Capture NVRAM** – Check the factory Flash settings before making any modifications. Save to Computer and Tech computers.
☐	**Check Init and Firmware Version** – Type **v** & press *Enter*. Capture the screen or write down the information. Make updates if necessary.

Interface Board	_____	Init File Version Loader	_____
Controller Board Revision	_____	Init File Version STD	_____
Firmware Version (MCIF)	_____	MD4 Version	_____

☐	**Help Files** – Manuals & Help Docs	☐	**JobNameServer** – Confirm operations.
☐	**JobReporter** – Confirm operations.	☐	**JobEditor** – Confirm operations.
☐	**ConnectionManager** – Confirm operations.	☐	**JobConsole** – Check if Auto Preview works & if Job Monitor is on.

ConnectionManager Setup

☐	1. Open ConnectionManager.	☐	6. Highlight the XMI file for the machine and select *Open*.
☐	2. Right-click on No_Connection_Info next to the machine to be added and select *Add*.	☐	7. Select *Yes* at the notice.
☐	3. Highlight either an existing connection if the new machine is being added to the network or *None* if this is a new setup.	☐	8. Refer to the ConnectionManager dialog and locate the specific machine connection.
☐	4. Check the box next to Auto Launch JobNameServer.***	☐	9. Right-click on the connection and select *Report a Problem*.
☐	5. Check the box next to Set Preferred Neti using the Current Neti if the customer wants this computer to be in charge of all communications.***	☐	10. Set up the following email settings: • Email: email address of the contact person for the machine • Server: mail.multicam.com • To: suite4@multicam.com

Mechanical Installation: PHASE III

Option Installation

☐	**Fume Extraction** – Adjust the air flow.	☐	**Bar Code**

☐ **Run a test file to verify machine operation**.

Introduction

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Customer Responsibilities for Safety

As the user of the ***MultiCam*** machine, each customer **must** follow all safety procedures that are clearly outlined when operating each machine and its parts. Failure to do so may result in damage to property or personnel and could even result in death. These machines are powerful and should always be treated with care.

While an excellent cutting tool in this industry, the laser introduces unique hazards to the work area. The focused beam uses a higher power density to mark, cut, and weld materials within a defined area and experiences a decline in hazardous conditions as the beam pattern expands. The collimated beam either directly from the laser head or diverted by a mirror without any focusing optics can cause serious damage to the eyes, skin, or flammable materials within hundreds of feet from the source. ANSI, state regulations, and OSHA offer companies guidelines to ensure safe cutting and improved operations.

The Class IV Laser offered by ***MultiCam*** has specific requirements that are stipulated by each State Attorney General and the Federal government. Members are strongly encouraged to review the information and follow the stipulations for laser operation and maintenance. Control measures for any installation of a Class IV laser must be implemented to be in compliance, such as completed training and medical testing of operators, controlled access areas in place for trained personnel only, enclosed beam paths where feasible, posted warning signs, protective eyewear and clothing, protective barriers, establishment of standard operating procedures (SOP), a trained Laser Safety Officer (LSO) to evaluate potential hazards and ensure proper adherence to control measures, and other requirements as set forth in ANSI, state regulations, and OSHA documents. Any facility with a Class I Laser is exempt from following these requirements unless a Class IV energy source can be accessed during standard maintenance or service.

Members may refer to ANSI Z136.1 Standard for Safe Use of Lasers to review the laser hazard evaluations, limits for maximum permissible exposures (MPE), company-wide control measures, LSO requirements, and outlines for training and medical surveillance programs. Members may also locate their respective State Attorney General at www.naag.org/ag/full_ag_table.php to determine the regulations for operating the laser in their state. The state regulations are primarily based on the ANSI Z136.1 laser safety standard. All members should access the FDA site www.accessdata.fda.gov and then select *Search*, enter "Part 1040 Performance Standards for Light-emitting Products," and click on *Performance Standards for Light-emitting Products* to review the Federal requirements for the laser. While OSHA has no specific documents regarding laser safety requirements, any OSHA inspector visiting a facility that uses a laser will follow OSHA Instruction PUB 8-1.7 Guidelines for Laser Safety and Hazard Assessment, which is based on the ANSI Z136.1 laser safety standard. The company LSO may contact the ***MultiCam*** LSO with any questions.

Customers should make plans for safeguarding themselves and their work areas at the point of operation as all ***MultiCam*** machines have been designed and constructed to operate under specific parameters relating to the particular application. As a result, ANSI B-11 *Safety Standards* states that "It shall be the responsibility of the end-user (buyer) to provide, and ensure the use of a guard, guarding device, awareness barrier, awareness device or shield..." in order to maintain the required level of protection. Additional requirements may be in place per the State Attorney General's office and must be followed to be in compliance with OSHA standards.

MultiCam has available certain safety shields and guards applicable to our machines. Please contact our office for styles, types, and prices.

Personal Safety Precautions

All customers should become familiar with all aspects of their machines.

Any person who operates or does any maintenance on this equipment should be aware that safety procedures are an important part of the daily job. Customers and related personnel should work with the LSO to learn how the equipment functions and be able to respect the capabilities of the machinery. Anyone working on or around the equipment should understand the potential losses associated with mishandling the machinery and its parts and be able and willing to follow all safety precautions. Sudden movement, loud noises, horseplay, etc. must be avoided, as such distractions may result in unsafe conditions.

Accidents can occur if clothing or other articles become entangled in the laser head or other moving parts of the machines. The following suggestions, if followed, will reduce the chance of having these types of accidents:

1. Wear **approved eye and hearing protection** at all times when operating the laser. Safety eye wear must be correctly rated for the laser to ensure safety compliance. Customers will receive at least 1 set of appropriate eye wear and may purchase any additional sets of eye wear for personnel who will be involved simultaneously with the laser.
2. Restrain long hair with a **cap or net** when near the machines.
3. Avoid wearing neckties and scarves during machine operation.
4. Avoid wearing loose fitting clothing during machine operation.
5. Avoid wearing hanging jewelry during machine operation.
6. Wear only cloth or lint-free gloves when working on electrical parts.
7. Avoid operating this and any other equipment if affected by alcohol, drugs, or any other substance or condition that may decrease judgment or alertness.
8. **Observe and follow all safety signs** on the machine and in the surrounding areas.
9. Avoid placing hands on the tabletop when the laser is turned on.
10. Avoid leaning or placing anything on the bellows during laser operation or at-rest as this may damage the machine and affect the laser beam.
11. Lock out the incoming power supply when any type of maintenance or other work is being performed on the machine.

Work Area Safety

Fire extinguishers should always be readily accessible, and operators should always familiarize themselves with the fire prevention recommendations for each component of the CNC system. It is important to always keep the work area **clean and uncluttered**. Oil, debris, or water on the floor can cause unsafe conditions. Customers should be sure that all work areas are free of hazardous obstructions and that all tools and other equipment are returned to their proper storage place when not in use. When working with oxygen, operators should refer to the Safety Measures for Handling Oxygen. Operators should never leave a laser unattended during the cutting sequence.

Installation Safety

An electrician must read and understand the electrical schematics prior to connecting the machine to the local power system. Connecting the wrong voltage power will void the warranty. All switches should be turned to the OFF position before power is connected. The main disconnect switch should always be locked in the OFF position if the machine is left unattended. When the machine is installed, the electrician or Operator should be sure that all motors rotate in the correct direction.

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Power Lockout Instructions

MultiCam machines are equipped with a built-in main power lockout device. If any kind of repair work or maintenance is being performed on the machine or control cabinet, the Operator should **disconnect power** from the machine **before starting work**. Lasers should be de-energized prior to maintenance. This may take between a few minutes and an hour depending on the power of the laser.

1. Turn the main disconnect switch to the OFF position.

2. Flip out the plastic lockout latch.

3. Insert any padlock into one of the holes of the lockout latch. With the plastic lockout latch in this position, the switch cannot be moved to the ON position.

1

2

3

4. Throw the bulkhead switch to the OFF position.

5. Open the control cabinet.

6. Make sure the LEDs on the drives and inverters are not lit. It may take a few minutes for the light from the LEDs to fade away.

7. Make sure the incoming voltage for L1, L2, and L3 is 0v.

8. Follow the standard Tag Out procedure in tagging the disconnect switch.

Introduction

Precautions When Handling the Electrical Components of a Laser

Company LSOs and ***MultiCam*** LSOs may have cause to handle the electrical components of a laser during everyday use or maintenance. All personnel involved in the operations or maintenance of a laser or other machine should wear cloth or lint-free gloves when working on electrical parts and observe the following activities:

1. Treat all electrical equipment as if it were active.

2. Complete any work on the laser in pairs so that the buddy system is in place. Both operators should be knowledgeable in first aid and cardiopulmonary resuscitation.

3. Remove any rings, watches, pens, pencils, or rulers before working with any type of electrical equipment.

4. Use only tools with insulated handles whenever working with electrical equipment.

5. Report any electrical equipment that gives even the slightest indication of current.

6. Assume that the floor under high voltage systems is conductive and grounded unless standing on a suitably insulated dry matting that is approved for electrical use.

7. Avoid standing in wet areas when working on active electrical equipment. Operators should take all precautions toward preventing excessive moisture or perspiration on the hands, feet, or body.

8. Decline from working on hazardous systems or completing hazardous activities if fatigued. Operators who are under the influence of medication that slows response time should not be allowed to work on electrical equipment, nor should operators who are emotionally or chemically conducive toward taking life-threatening risks with any electrical equipment.

Introduction

Safety Measures for Handling Oxygen

Oxygen can be an effective gas for cutting sequences, but special care should be used when working with oxygen or any other pressurized gas. Operators should observe the following precautions at all times when working with oxygen:

- Refer to oxygen as “oxygen” and not as “air.” Operators should use oxygen cylinders for cutting sequences only. At no point should operators substitute oxygen for compressed air in pneumatic tools or use oxygen to dust off clothing or materials, purge tanks, blow out pipe lines, or test radiators.

- Store oxygen upright in storage areas that are no closer than 20’ (6.1m) away from highly combustible material (e.g., oil, grease). Operators could instead use a 5’ (1.5m) tall gas-tight, non-combustible partition with no openings and with a fire resistance rating of at least 1 hour to provide the required separation.

- Handle oxygen cylinders with great care when in use or in transit. The cylinders should not be dropped, knocked over, or struck with heavy objects.

- Contact the cylinder manufacturer if repairs are needed on the oxygen cylinder valves. At no point should an operator use a hammer or wrench to open the valves.

Like all pressurized gases used in cutting, oxygen requires that operators approach and handle the cylinders with great care. When operators use oxygen in the cutting sequence, they should follow these steps:

1. Stand to the side before opening each oxygen cylinder valve and blow out debris from the nozzle. Operators should use a clean cloth to swab the connection seat.

2. Attach the pressure regulators after the cylinder valve has been cleaned out. Pressure regulators reduce cylinder pressure to low; high cylinder pressure will cause the hose to burst.

3. Check that the regulator tension screw is released and then open the oxygen cylinder valve slowly. This will prevent damage to the regulator high pressure gauge.

4. Open the valve fully when using oxygen in the cutting sequence to prevent any leakage around the valve stem.

5. Close the cylinder valve and reapply the protecting caps when not using oxygen in the cutting sequence.

For additional information regarding the handling and use of oxygen, operators should consult the Oxygen Material Safety Data Sheet (MSDS).

Introduction

Labels

Each machine produced by ***MultiCam*** includes certain cautions, warnings, dangers, and notices placed on the moving parts of the machine (e.g., gantry, carriage) as well as the stationary parts (e.g., electrical enclosure). These labels are in place to encourage employees to observe safe operating practices at all times. The text on these labels is almost always capitalized and presented in bold format. Any auxiliary equipment (e.g., vacuum pump, chiller) will include vendor-specific labels advising the customer of proper safety practices regarding those units as well. The serial number label is unique to the machine. The most common labels are identified below.

Cautions

Caution labels indicate the potential for minor or moderate injury and are usually yellow with black writing. These labels are normally placed on the gantry, axis covers, and any other covers that are located at the front of the machine.

Warnings

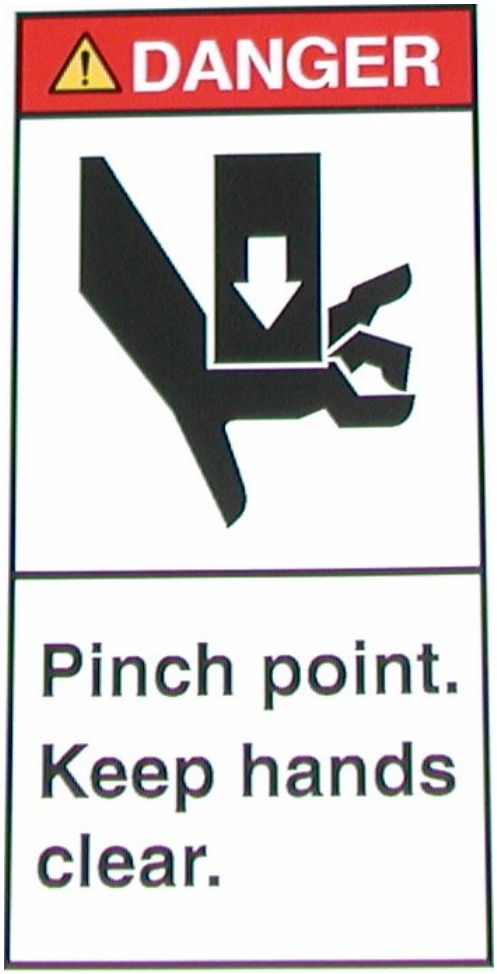
Warning labels indicate the potential for death or serious injury and usually show the word WARNING in black writing against an orange background. These labels are normally located in areas where serious injury could be sustained, such as the carriage.

WARNING
Crush hazard.
To avoid tip over, this equipment must be securely fastened to the floor.

WARNING
Enclosure is TOP–HEAVY
• Stabilize enclosure before opening doors.
• Follow guidelines in "Large Enclosure Handling Manual".
• DO NOT remove this label until enclosure is permanently installed.
• Label must be reattached if removed for painting.
• To get additional copies of the "Large Enclosure Handling Manual" or labels, call 1–800–355–3560.
93268001, Dwg. Rev. G

Dangers

Danger labels indicate the probability of death or serious injury and usually show the word DANGER in white writing against a red background. These labels are normally located in areas where serious injury could occur.



Notices

Notice labels indicate the potential for property damage and usually show the word NOTICE in white writing against a blue backdrop. This label is normally located at the front of the machine.

Serial Number

The serial number label indicates the name and contact information for the company, specific serial number for the machine, and voltage and amp information for the operating system. This specific information relates to the table only. Each auxiliary unit has its own serial number tag with machine-specific information.

Introduction

Labels, Warnings, and Cautions

The Federal government requires specific labels, warnings, and cautions to be in place for any laser use or maintenance, and the State Attorney General's office, ANSI, and OSHA also require certain forms of notification regarding the dangers inherent in Class IV Lasers like those available through ***MultiCam***.

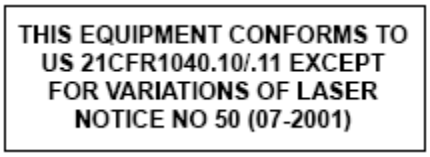
CAUTION – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

CAUTION – THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD.

Labels

The following labels are used on each laser, and the meaning for each is included.

The statement of conformity is located over the rear cover and guard.



The manufacturer identification is located over the rear cover and guard.

Warnings

Each laser has specific warning labels that are required to be located in specific areas.
The aperture label is located over the front cover and guard.

The warning logotype is located over the rear cover and guard and is based on the rated continuous power of the laser purchased.

Rated Continuous Power	Peak Power	Corresponding Label
100 Watts	400 Watts	
200 Watts	700 Watts	
400 Watts	1400 Watts	

Cautions

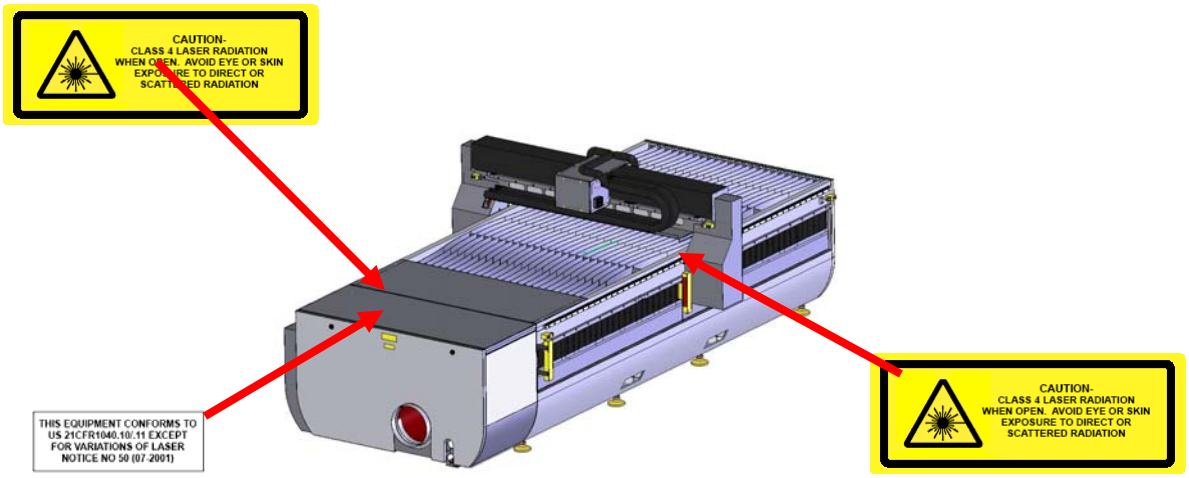
Each laser has specific cautionary labels that are required to be located in specific areas.

The non-interlocked panel label is located over the operator access door to the carriage.

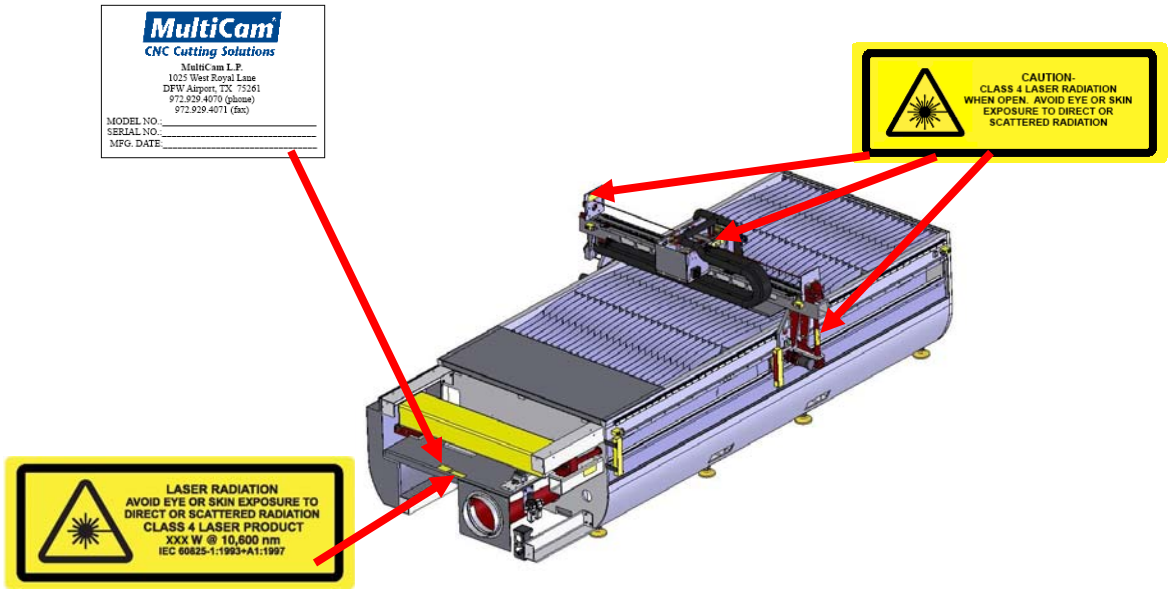
The interlocked panel label is located near the gantry, bellows, beam guard tubes, and rear cover.

The approximate locations are shown below.

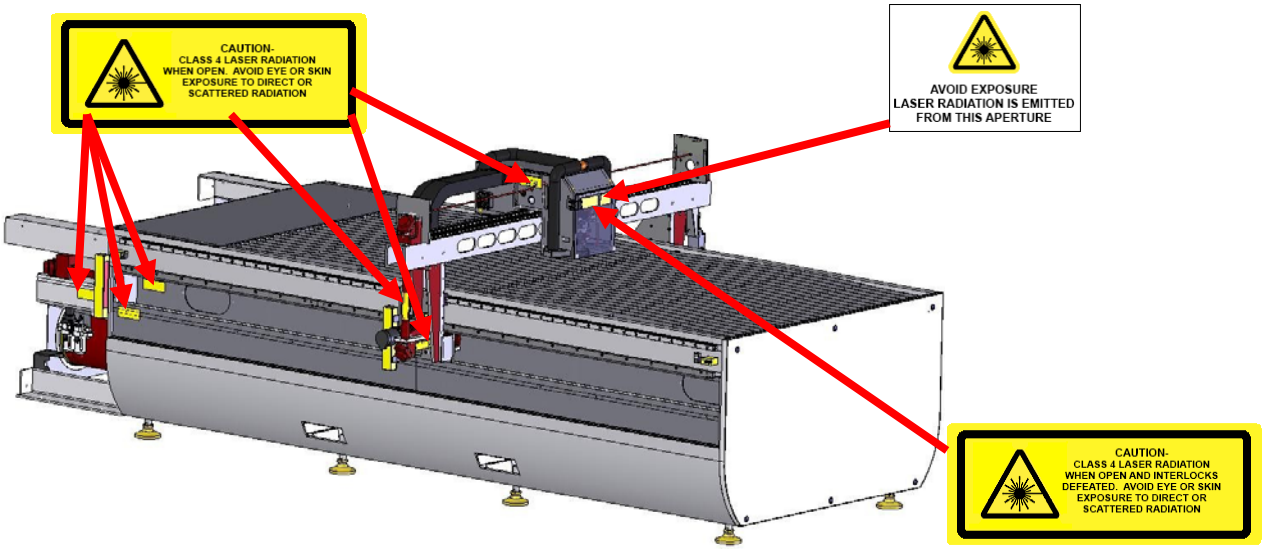
Exterior Back



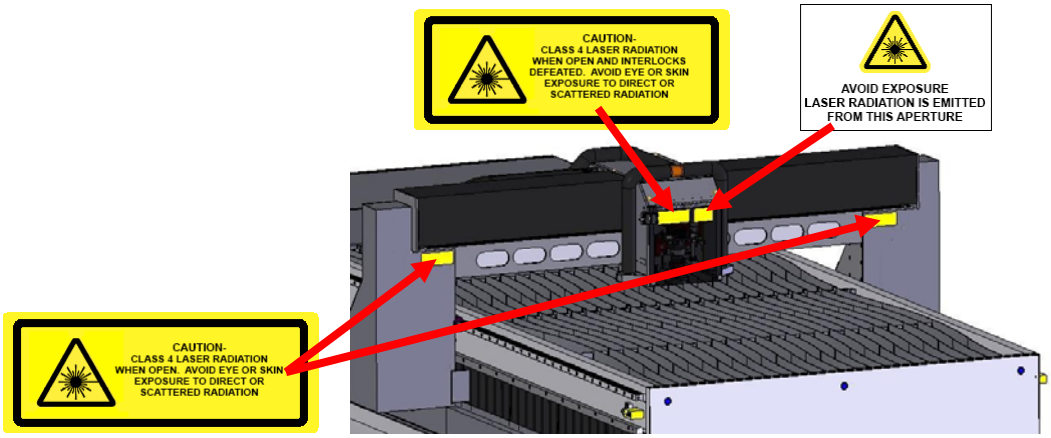
Interior Back



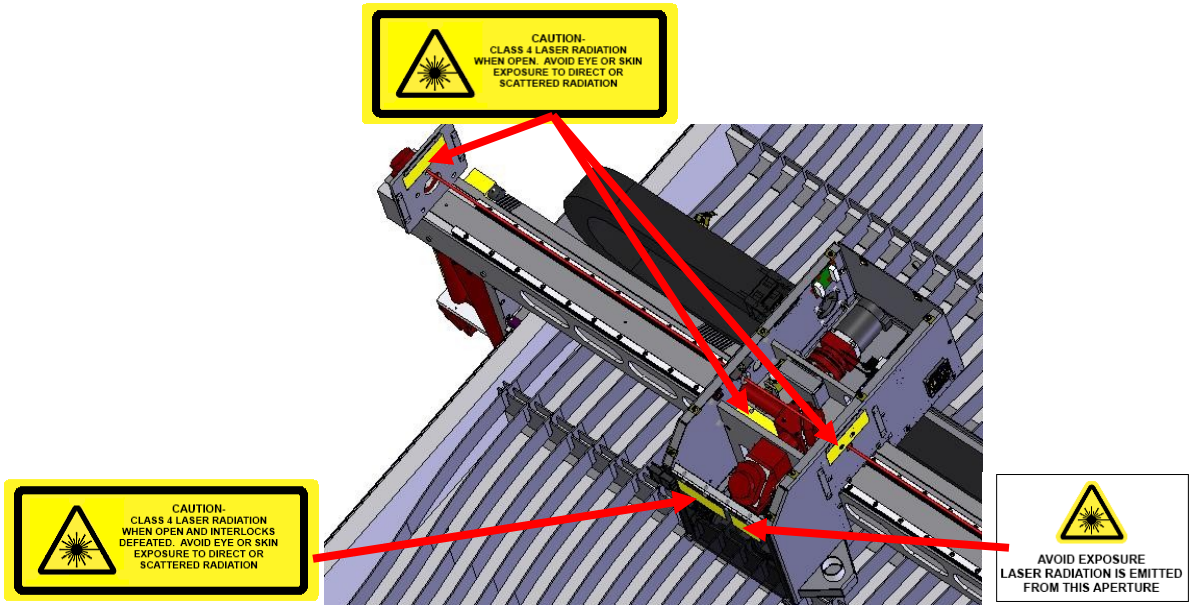
Full XB Side



Exterior Gantry and Carriage



Interior Gantry and Carriage



All personnel entering a Class IV area must be adequately trained and provided the proper eye wear. Each laser will include at least 1 set of approved eye wear, and customers will need to purchase any additional eye wear (Part #24-00071-00 or #24-00071-01) for any other person who will be simultaneously involved with the laser.

Introduction

Labels, Warnings, and Cautions on GenV Lasers

The Federal government requires specific labels, warnings, and cautions to be in place for any laser use or maintenance, and the State Attorney General's office, ANSI, and OSHA also require certain forms of notification regarding the dangers inherent in Class IV Lasers like those available through ***MultiCam***.

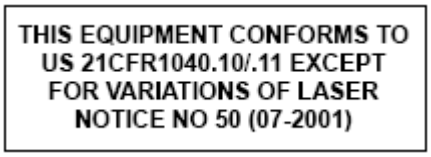
CAUTION – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

CAUTION – THE USE OF OPTICAL INSTRUMENTS WITH THIS PRODUCT WILL INCREASE EYE HAZARD.

Labels

The following labels are used on each laser, and the meaning for each is included.

The statement of conformity is located over the rear cover and guard.



The manufacturer identification is located over the rear cover and guard.

Warnings

Each laser has specific warning labels that are required to be located in specific areas.
The aperture label is located on the beam bender 2 mounting plate.

The warning logotype is located on the rear gantry cover and the gantry top plate and is based on the rated continuous power of the laser purchased.

Rated Continuous Power	Peak Power	Corresponding Label
100 Watts	400 Watts	
200 Watts	700 Watts	
300 Watts	1500 Watts	
400 Watts	1400 Watts	
600 Watts	3000 Watts	

Cautions

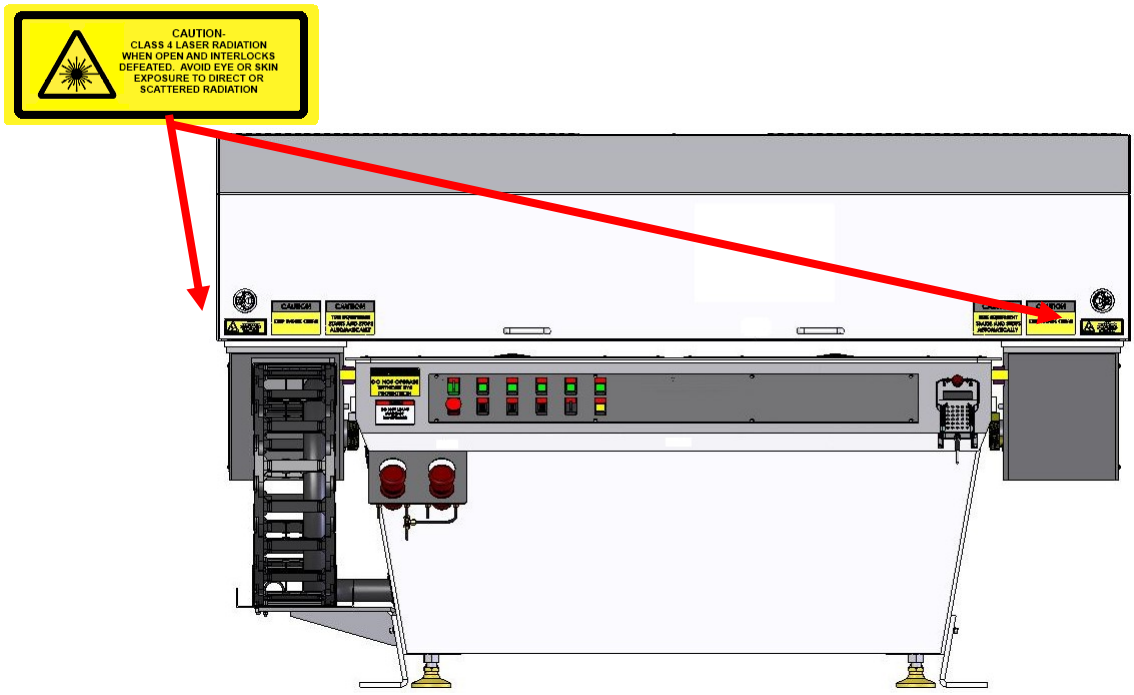
Each laser has specific cautionary labels that are required to be located in specific areas.

The non-interlocked panel label is located on the safety shutter access panel and beam tube between beam benders 2 and 3.

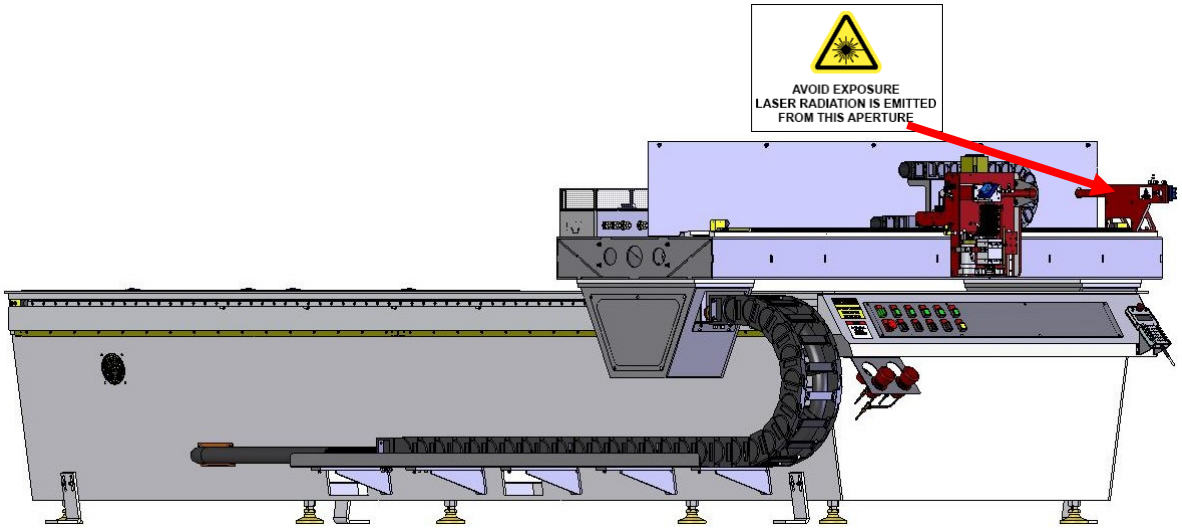
The interlocked panel label is located on the gantry front cover beside the latches.

The approximate locations are shown below.

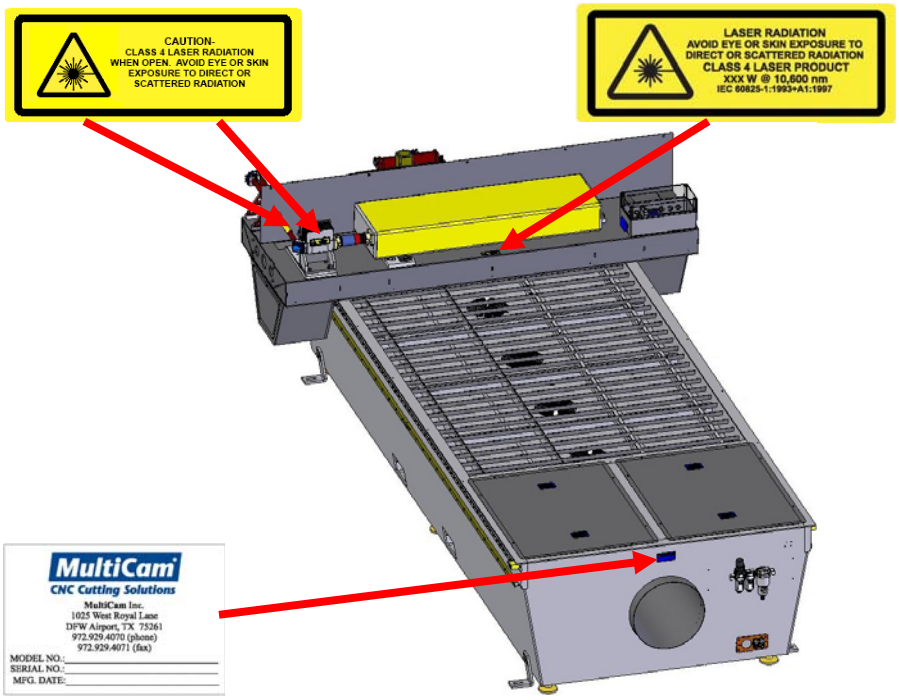
Front Gantry Cover



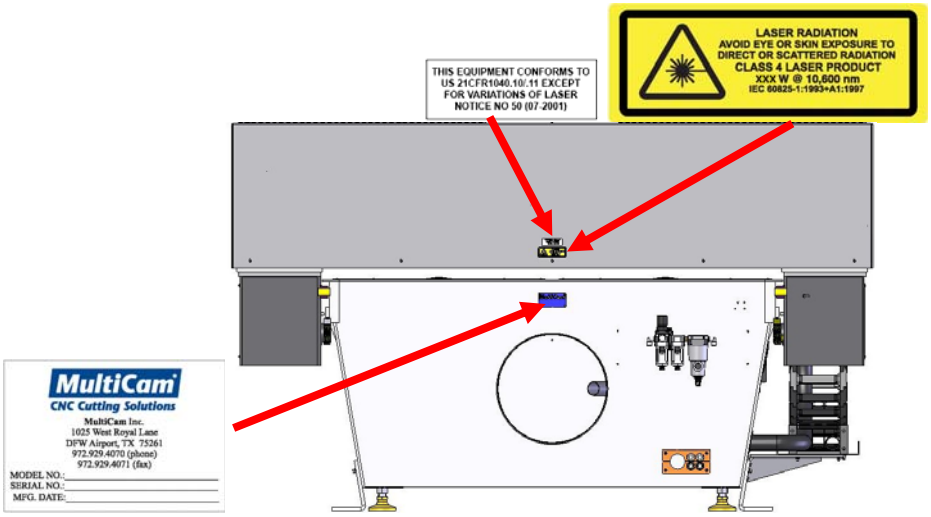
Interior Front Gantry



Interior Back Gantry



Exterior Back Cover



All personnel entering a Class IV area must be adequately trained and provided the proper eye wear. Each laser will include at least 1 set of approved eye wear, and customers will need to purchase any additional eye wear (Part #24-00071-00 or #24-00071-01) for any other person who will be simultaneously involved with the laser.

Introduction

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Fast Starts

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Fast Start Laser

1. **Turn on Power**
   Locate both power switches: the round knob located on the control enclosure and the power switch on the operator's console.
   Rotate both to the ON position. The machine will not operate if one of the power switches is OFF.

2. **Turn on Air Pressure**
   Use the knob to adjust the air pressure.
   Verify the pressure is between 80 and 100 psi.

3. **Open Gas Bottles**
   Turn the valve fully counter-clockwise (fully open) if used.
   Verify the pressure is adequate for machines with capacitive height systems that cut ferrous metals and machines with no capacitive height systems that cut non-ferrous metals.

4. **Turn on Laser**
   Rotate knob to the ON position.
   Verify the chiller is turned on. The laser will not work without the chiller being on.

5. **Find Machine Hard Home**
   Press Shift and Go Home to find the hard home 0,0 or the machine home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches.

6. **Set Home**
   Press Jog Arrows to place the **center of the head assembly** over the front right corner of the material.
   Press Jog Speed to set the speed of the movement to slow, medium, or fast as necessary for the project and material.
   Press Set Home to set the home location for the head assembly. The system will prompt the operator as to whether the selected position should be set as home, and the display will read "Press Down to set Rotation Point." See Rotate File for a description of this function.
   Press Enter to confirm the position.

7. **Set Surface** for ferrous metals or machines with capacitive height sensors

   Press Jog Arrows to position the **center of the head assembly** over the material to be cut.

   Press Set Surface .
   Enter the material thickness.

   Press Z-axis Jog Arrows to lower the Z-axis until the head assembly is approximately 1/4" above the material.

   Press Zero to begin the surfacing routine. This will cause the Z-axis to move down slowly until the tool comes in contact with the surface block and then move up above the surface block to the Lift Height.

8. **Set Surface** for non-ferrous metals or machines without capacitive height sensors

   Press Jog Arrows to position the **center of the head assembly** over the material to be cut.

   Press Set Surface .
   Enter the material thickness.

   Press Z-axis Jog Arrows to position the surface sensor over the material to be cut.

   Press Zero to begin the surfacing routine. This will cause the Z-axis to move down slowly until the surface sensor comes in contact with the surface block and then move up above the surface block to the Lift Height.

9. **Turn on Fume Extraction**

   Turn on fume extraction to prevent creating unsafe conditions. Operators should make sure that the fume extraction system is turned off when the laser is off.

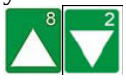
10. **Access DNC**

    Verify that JobServer or JobNameServer has been activated on the computer.

    Press DNC . This will display a list of job folders and job files, which are located in the C:\Dncfiles directory.

    Press X-axis Jog Arrows until the appropriate folder is highlighted in blue.

    Press Enter to display the DNC files that are available in that particular folder.

    Press X-axis Jog Arrows  until the appropriate file is highlighted in blue.

    Press Start to begin the file.

11. **Start / Cancel / Pause**

Press Start to begin the cutting sequence.

Press Cancel to abort the cutting sequence.

Press Pause to yield the cutting sequence.

Operators should never leave a laser unattended during the cutting sequence.

Fast Starts

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Fast Start Laser – MultiVision

1. **Turn on Power**
   Locate the power switch, the round knob in the control enclosure, and rotate it to the ON position.
   Make sure that Suite4 and VisionTool4 or MultiVision are installed on the computer
   Make sure the dongle is in place on the computer as the software will not run without the dongle.

2. **Turn on Air Pressure**
   Use the knob to adjust the air pressure.
   Verify the pressure is between 80 and 100 psi.

3. **Open Gas Bottles**
   Turn the valve fully counter-clockwise (fully open) if used.
   Verify the pressure is adequate for machines with capacitive height systems that cut ferrous metals and machines with no capacitive height systems that cut non-ferrous metals.

4. **Turn on Laser**
   Rotate knob to the ON position.
   Verify the chiller is turned on. The laser will not work without the chiller being on.

5. **Find Machine Hard Home**
   Press Shift and Go Home to find the hard home 0,0 or the machine home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches.

6. **Set Surface** for ferrous metals or machines with capacitive height sensors
   Press Jog Arrows to position the **center of the head assembly** over the material to be cut.
   Press Set Surface .
   Enter the material thickness.
   Press Z-axis Jog Arrows to lower the Z-axis until the head assembly is approximately 0.25” (6.35mm) above the material.
   Press Zero to begin the surfacing routine. This will cause the Z-axis to move down slowly until the tool comes in contact with the surface block and then move up above the surface block to the Lift Height.

7. **Set Surface** for non-ferrous metals or machines without capacitive height sensors

   Press Jog Arrows to position the **center of the head assembly** over the material to be cut.

   Press Set Surface .
   Enter the material thickness.

   Press Z-axis Jog Arrows to position the surface sensor over the material to be cut.

   Press Zero to begin the surfacing routine. This will cause the Z-axis to move down slowly until the surface sensor comes in contact with the surface block and then move up above the surface block to the Lift Height.

8. **Set Home**

   Press Jog Arrows to place the **center of the head assembly** over the first fiducial.

   Press Set Home .

   Press Enter to accept the location.

9. **Focus the Camera** (must be done each time the material thickness changes)

   Click on Live Feed in the toolbar and Jog the camera over the fiducial.
   Loosen the Screw Adjustment Handle.
   Adjust the height of the camera using the Ball Screw Locking Clamp.
   Tighten the Screw Adjustment Handle once the fiducial is in focus.

10. **Capture the Fiducial**

    Click on Live Feed in the toolbar and Jog the camera over a fiducial. Operators may need to loosen the Screw Adjustment Handle and adjust the Ball Screw Locking Clamp to bring the fiducial into focus. The spotlight will flash while the camera is in Live Feed mode.

    Click on Capture Fiducial in the toolbar. A box should appear around the fiducial .

11. **Turn on Fume Extraction**
    Turn on fume extraction to prevent creating unsafe conditions. Operators should make sure that the fume extraction system is turned off when the laser is off.

12. **Access a MultiVision Job File**

    Press DNC and select the file. The VisionTool4 application will become active, and the camera will Jog to the estimated location for the first fiducial.
    Watch the system Jog to the remaining fiducials in the order set forth by EnRoute. The value entered in Auto Find Setting will determine how far the camera will search for each fiducial.

13. **Start / Cancel / Pause**

Press Start to begin the cutting sequence.

Press Cancel to abort the cutting sequence.

Press Pause to yield the cutting sequence.

Operators should never leave a laser unattended during the cutting sequence.

Fast Starts

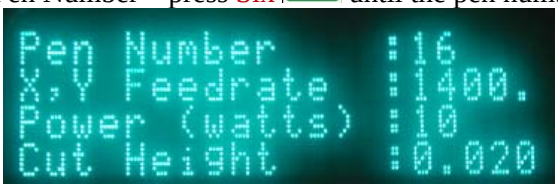
Rastering a File

Laser operators can raster a JPEG or bitmap file the same way that they complete a regular cutting operation but with minor changes in the parameter setup. The basic operation differs slightly for machines with the latest version of Suite4 (i.e., 4.1 or higher), and operators may merge files together for a raster vector file using JobEditor.

Rastering an Image – Basic Operation

1. Set the following Params_2D menu items*:

   - Pen Number – press Six until the pen number shows 16 (i.e., rastering)

   - Feedrate
   - Power
   - Cut Height
   - Bidirectional Coefficient

   The following Params_2D menu items may also be changed:
   - Lift Height – distance the cutting head moves between cuts; must always be positive
   - Contrast – may need to be adjusted per cut per image
   - Brightness – may need to be adjusted per cut per image

   *All parameter settings are based on the operator's preference. Pen 16 is the default setting for rastering, but operators may choose Pen 1 for cutting or Pen 2 for engraving. The active pen number will be shown on the home screen (e.g., T16).

2. Press Cancel to reach the main menu.

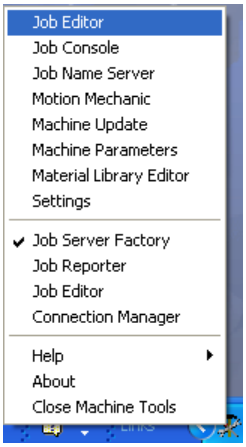
3. Position the cutting head at the center of the material. Raster images will begin at the center of the image by default. Operators may change this setting in JobEditor as described below in **Changing the Start Position**.

4. Press DNC to pull up the file on the laser.

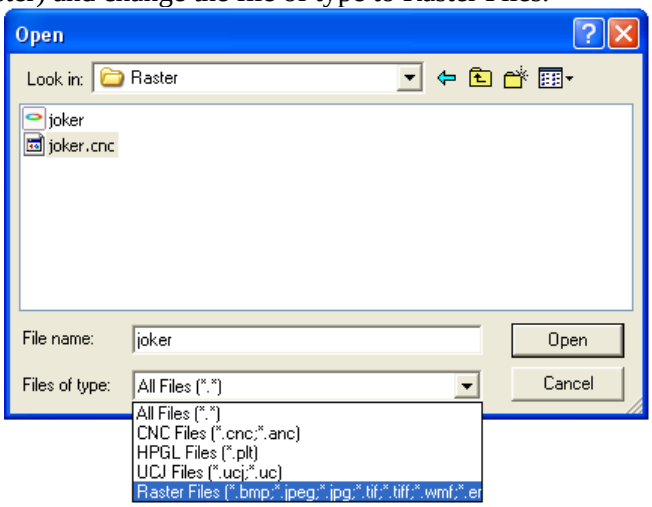
5. Press Start twice to begin the cutting sequence.

Rastering an Image – Suite4 Operation

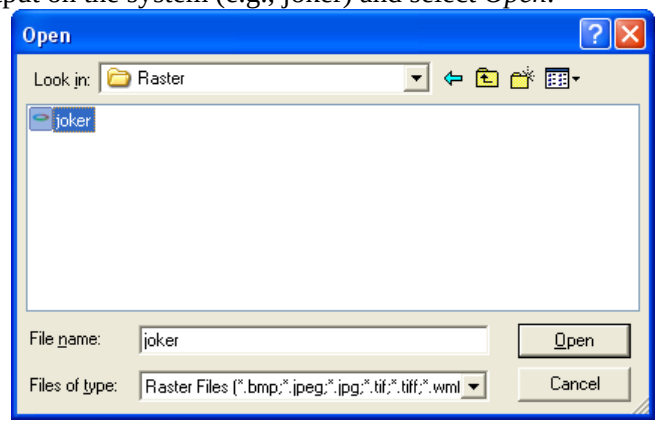
1. Click on Machine Tools in the bottom toolbar next to the clock and open JobEditor.



2. Open a raster file (e.g., Raster) and change the file of type to Raster Files.



3. Highlight the file to be output on the system (e.g., joker) and select *Open*.



4. Complete **Rastering an Image – Basic Operation** as shown above.

Merging with a Vector File

Operators using Suite4 to merge files and raster an image will need 2 additional items of software:

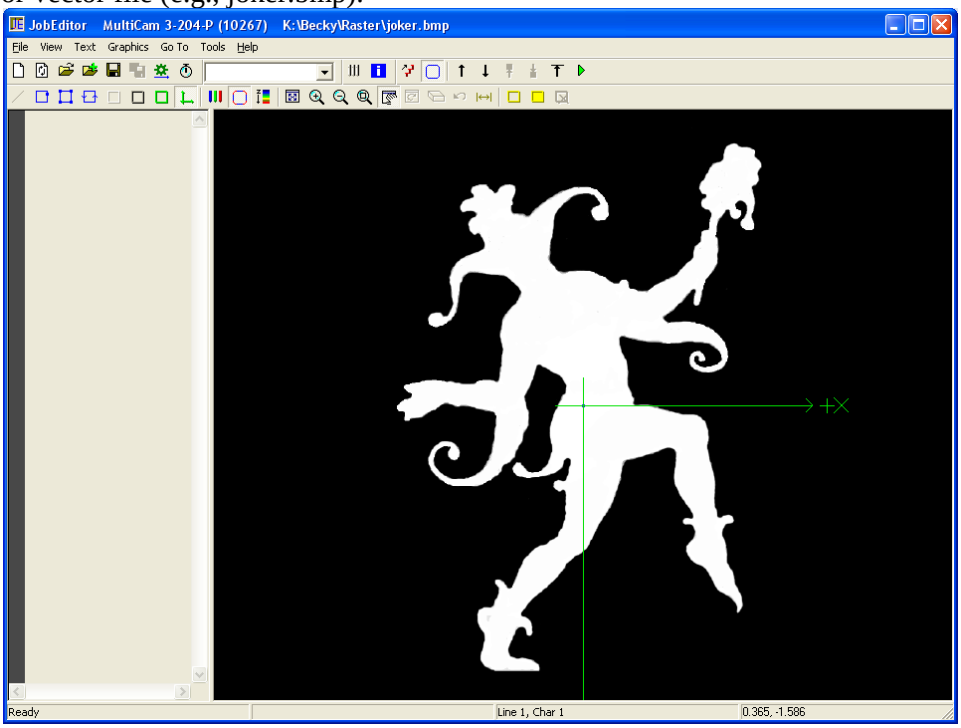
- Photo Editing program (e.g., PhotoShop)
- Tool-pathing program (e.g., EnRoute)

These additional items will generate 2 separate files that are needed to merge images in Suite4. The following directions describe how operators can merge vector files.

1. Close JobEditor if it is currently open.

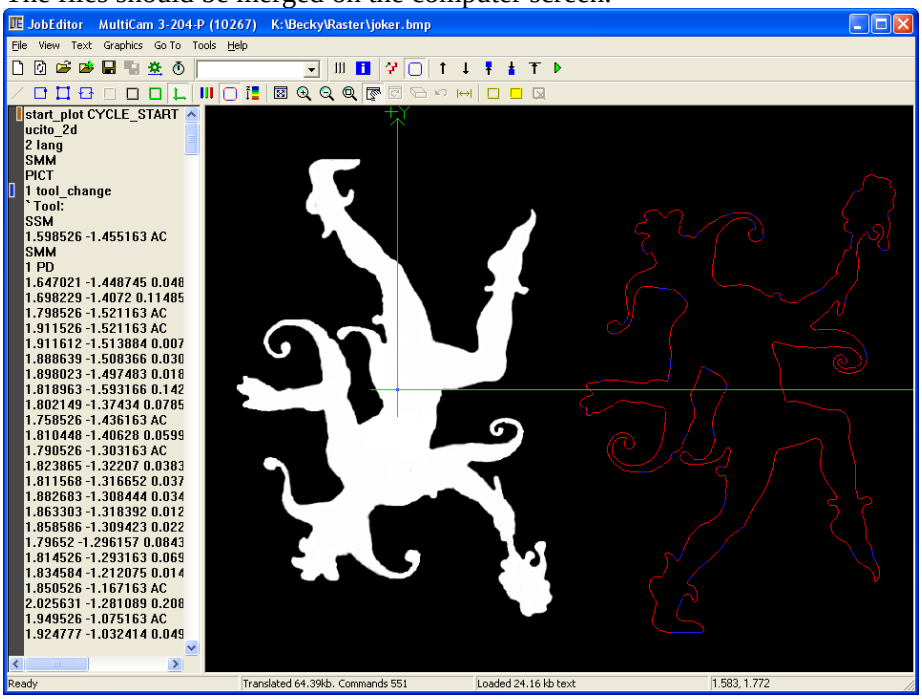
2. Open JobEditor to refresh the program.

3. Open a raster or vector file (e.g., joker.bmp).


JobEditor MultiCam 3-204-P (10267) K:\Becky\Raster\joker.bmp
File View Text Graphics Go To Tools Help
Ready
Line 1, Char 1
0.365, -1.586

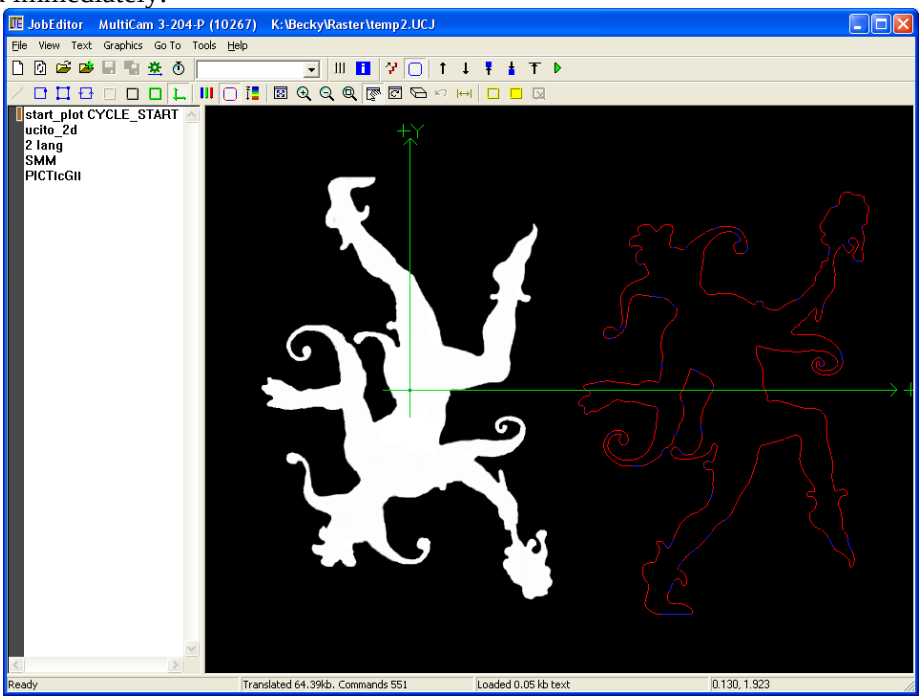
4. Click on in the top toolbar. This will configure JobEditor to merge 2 files.

5. Open a CNC file (e.g., joker.cnc).
   a. Highlight the file name.
   b. Select *Open*. The files should be merged on the computer screen.



JobEditor will default to raster the image first (SMM PICT in the code shown above indicates the raster image) and then cut the vectors. Operators can move or merge images in JobEditor.

6. Click and name the file (e.g., temp2) to create a unified file with both images. Any changes made to the file should be saved immediately.



7. Set Home at the center of the material.

8. Check settings in Params_2D (see **Rastering an Image – Basic Operation**). Operators can make any adjustments to Pen 16 (e.g., Feedrate, Cut Height) and then press Four to move back to Pen 1 and adjust the settings for cutting. During the regular operation sequence, the cut file will apply the settings entered at the keypad for each tool individually.

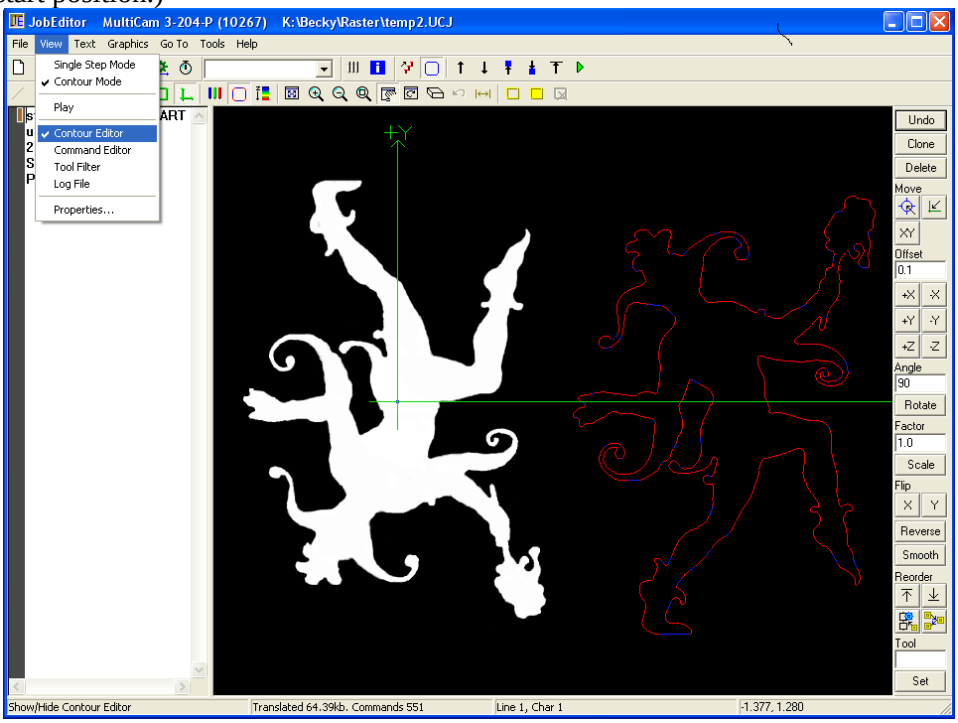
9. Press DNC to pull up the file on the laser.

10. Press Start twice to begin the cutting sequence.

Changing the Start Position

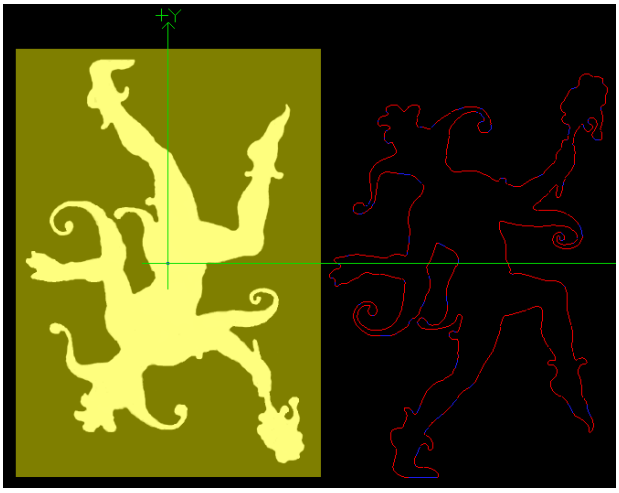
JobEditor sets the start position for raster files at the center of the image by default. Operators may change the start position in JobEditor by reconfiguring the file as described below.

1. Select View >> Contour Editor in JobEditor. This will open a toolbar on the right side of the computer screen. (Operators can make several changes to the cut file from this toolbar, but these directions will only discuss changing the start position.)

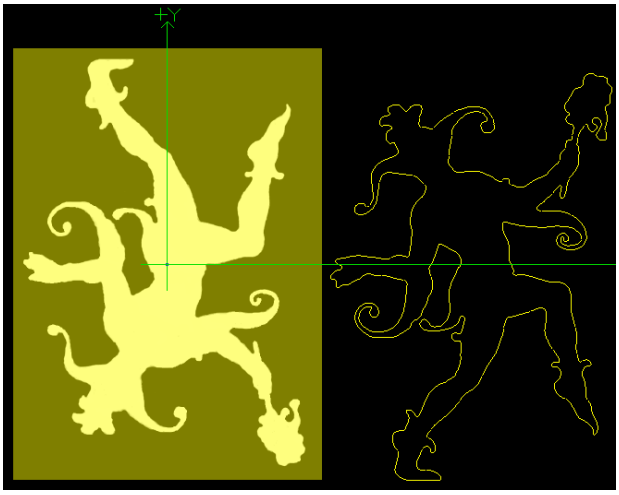


2. Click Select to select one point or Select All to select the entire image. Selected images are captured in a gold rectangle while selected CNC files are outlined in gold.

One Point

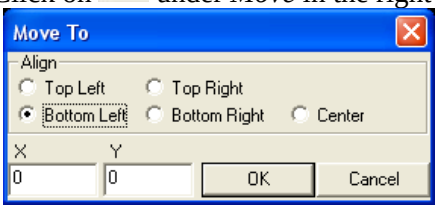


All Points



3. Make adjustments to the file. Operators can choose one of 3 ways to change the start position.

- Click on and then click in the image to manually identify 0,0.
- Click on to automatically move the Home configuration to 0,0.
- Click on under *Move* in the right toolbar and make adjustments per operator preference.



4. Click after each change.

5. Press DNC to pull up the file on the laser.

6. Press Start twice to begin the cutting sequence.

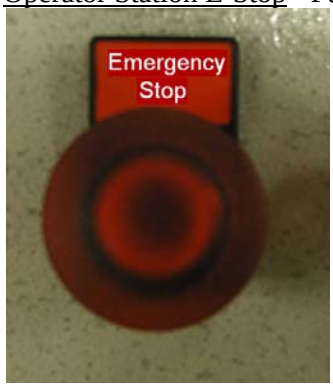
Fast Starts

Restarting after E-Stop

Operators may press the Emergency Stop (E-Stop) to immediately end any operations on the laser. Located on the keypad as well as the operator station and the side of the gantry, the E-Stop will power down the laser head, close the shutter, and remove power from the linear drives. Operators may restart the laser after the E-Stop has been pressed by following these instructions.

1. Reset the E-Stop.
   a. Keypad E-Stop - Rotate the knob clockwise until it pops up. The arrows on the knob also indicate the correct direction for resetting the E-Stop.

   b. Operator Station E-Stop - Pull the Emergency Stop knob.

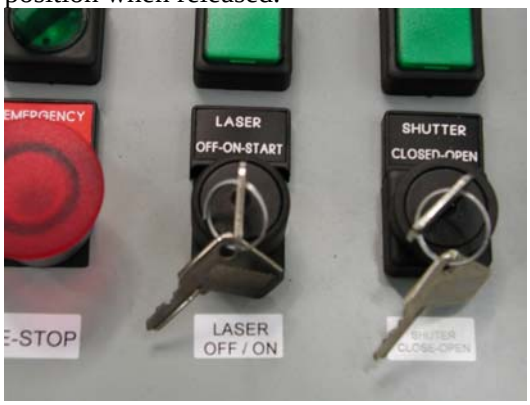


   c. Gantry E-Stop - Pull the Emergency Stop knob.

2. Press Shift and Go Home to find the Hard Home 0,0 or the Machine Home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches.

3. Move to the operator station.

4. Rotate the Laser key fully clockwise to start the machine. The key will automatically move back to the ON position when released.



5. Rotate the Shutter key clockwise to open the shutter.

6. Resume operation.

Fast Starts

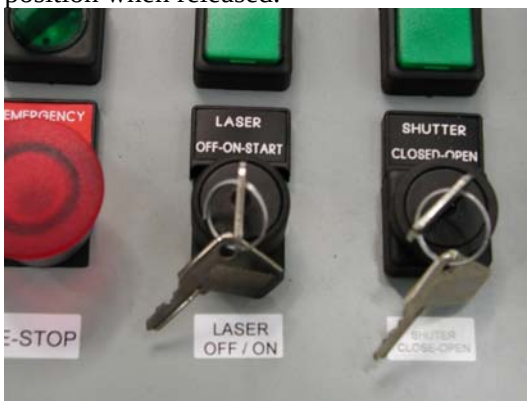
Restarting after Power Failure

Power failure affects the laser in a similar manner as when the operator pushes E-Stop. Once the power has been restored, the operator may follow these instructions to restart the laser.

1. Press Shift and Go Home to find the Hard Home 0,0 or the Machine Home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches.

2. Move to the operator station.

3. Rotate the Laser key fully clockwise to restart the machine. The key will automatically move back to the ON position when released.



4. Make sure the Shutter key is still pointing to Open.

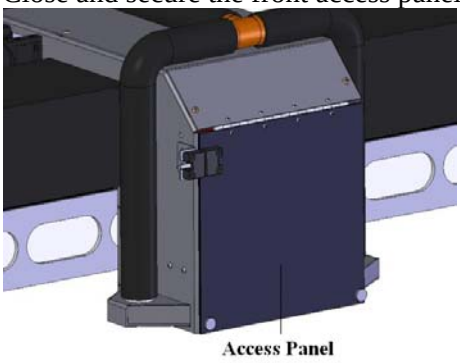
5. Resume operation.

Fast Starts

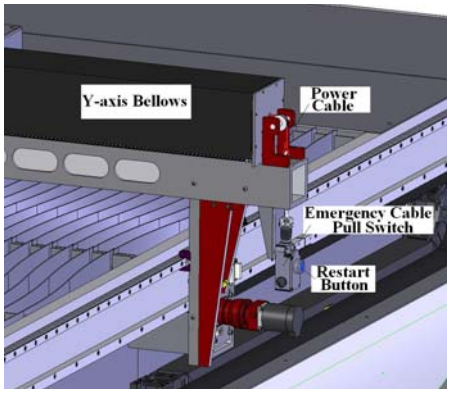
Restarting after Activation of Interlocks

The Interlocks are located inside the laser head assembly and in both the X- and Y-axis bellows and work as a precautionary measure during regular operations. If the front access panel is opened during operation, the system will pause motion and close the shutter. If the X- or Y-axis bellows constrict the cable, the system will pause motion and close the shutter. Operators may continue the job file after the activation of the Interlocks by following these instructions.

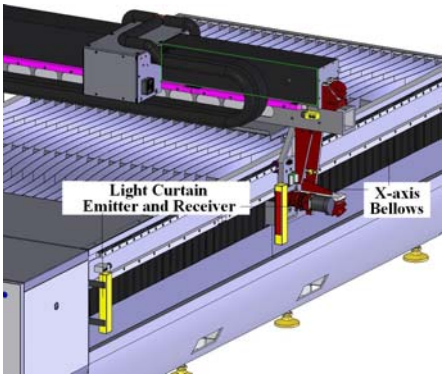
1. Correct the Interlock connection or miscommunication.
   a. Close and secure the front access panel.



   b. Determine the cause for the constriction on the Y-axis bellows, correct or replace, and press Restart to clear the Y-axis constriction.



   c. Remove the object that crossed the light curtain and correct or replace any portion of the X-axis bellows as needed.



2. Continue the job file once the Interlocks have been properly secured.

   a. Press Jog Arrows until the blinking cursor is over the “C” in Continue.

   b. Press Enter to continue the job file.

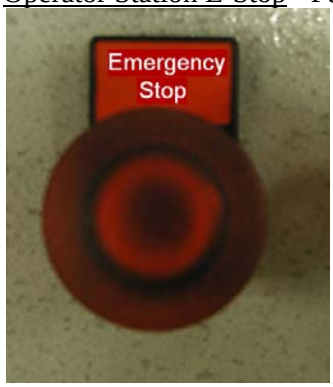
Fast Starts

Restarting GenV Lasers after E-Stop

Operators may accidentally or intentionally press the Emergency Stop (E-Stop) to immediately end any operations on the laser. Located on the keypad as well as the operator station and the side of the gantry, the E-Stop will power down the laser head, close the shutter, and remove power from the servo and stepper drives. Operators may restart the laser after the E-Stop has been pressed by following these instructions:

1. Reset the E-Stop.
   a. Keypad E-Stop - Rotate the knob clockwise until it pops up. The arrows on the knob also indicate the correct direction for resetting the E-Stop.

   b. Operator Station E-Stop - Pull the Emergency Stop knob.



   c. Gantry E-Stop - Pull the Emergency Stop knob.

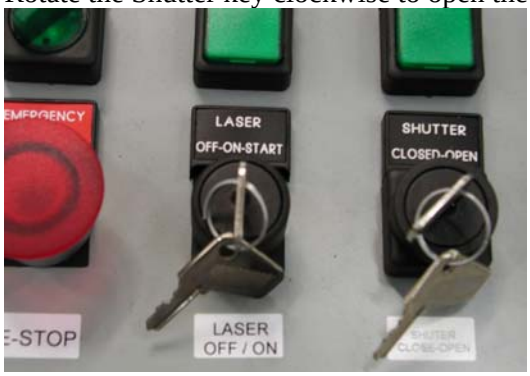
2. Press Cancel to exit the Emergency Stop screen.

3. Press Shift and Go Home to find the Hard Home 0,0 or the Machine Home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches. This process may take a few minutes.

4. Move to the operator station.

5. Rotate the Laser key fully clockwise to start the machine. The key will automatically move back to the ON position when released.

6. Rotate the Shutter key clockwise to open the shutter.



7. Resume operation.

Fast Starts

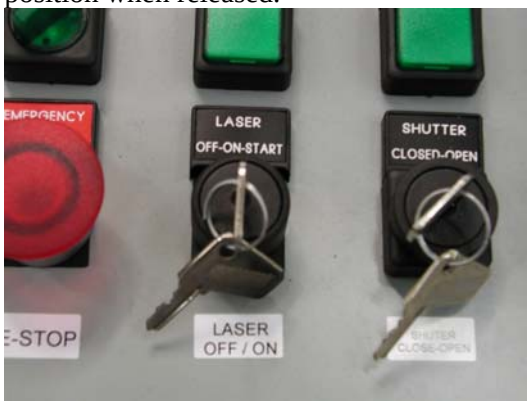
Restarting GenV Lasers after Power Failure

Power failure affects the laser in a similar manner as when the operator pushes E-Stop. Once the power has been restored, the operator may follow these instructions to restart the laser.

1. Press Shift and Go Home to find the Hard Home 0,0 or the Machine Home by indexing the gantry, carriage, and Z assembly off of the proximity limit switches.

2. Move to the operator station.

3. Rotate the Laser key fully clockwise to restart the machine. The key will automatically move back to the ON position when released.



4. Make sure the Shutter key is still pointing to Open.

5. Resume operation.

Fast Starts

Restarting GenV Lasers after Activation of Interlocks

The Interlocks are located inside the gantry front cover beside the latches and work as a precautionary measure during regular operations. If the gantry front cover is opened during operation, the system will pause motion and close the shutter. Operators may continue the job file after the activation of the Interlocks by following these instructions.

1. Close the gantry front cover.

2. Press Cancel to exit the Interlock screen.

3. Continue the job file once the Interlocks have been properly secured.
   a. Press Jog Arrows until the blinking cursor is over the “C” in Continue.

   b. Press Enter to continue the job file.

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Hints and Tips

The ***MultiCam*** Lasers have a very powerful yet easy-to-use interface. Operators who understand their systems and learn the keypad functions can utilize their cutting systems in an efficient and productive manner. The following tips complement this knowledge and can be used to the their advantage. Any operator with additional helpful hints or tips should send an email to support@multicam.com so that the User Manual can be updated.

#1 Observing Safety

Safety eye wear and hearing protection should be **worn at all times** while operating the machine, and long hair should be **restrained with a cap or net** when near the machines. Operators should observe the safety recommendations published by ANSI, state and federal governments, and OSHA. Operators should never leave a laser unattended during the cutting sequence, and labels should be observed at all times.

#2 Testing

When testing new processes or when learning new functions of the machine, use the Dry Run function.

#3 Recovering after Loss of Power

When Set Home (0,0) is pressed, the X,Y locations are stored in the controller's memory. If the system loses power, the job can be restored by returning to the last home and running Proximity Restart.

Operators may press Find Home to index the machine. Once the machine has found Home, the operator should press Return to Home 0 to move the machine back to the last home position and set home there before re-establishing the Set Surface (Z=0), Cut Height, Lift Height, X & Y Feedrate, and Pierce Power. The Proximity Restart function can then be used to resume the file.

#4 Maintaining the Machine

The ***MultiCam*** Laser will produce consistent, accurate work as long as it is well-maintained. Maintenance for this system is easy, yet it should not be overlooked. Operators may refer to the maintenance chart for more detail.

All machines should be kept clean when not in use. The build-up of dust and slag on the system should be cleared daily with special attention focused on the gear rack and bearing rails.

All of the bearings should be greased at least twice a month based on an 8-hour work day. The bearings should be greased more often if the machine is in use more than 8 hours a day.

The Lead Screw Z-axis should be lubricated with a non-aerosol, silicon-based lubricant. Operators are cautioned **against** using the lithium grease provided by ***MultiCam*** when lubricating Lead Screws as this may lead to premature wear of the Lead Screw. Ball Screws, however, can be lubricated with lithium. grease.

The filters on the electronics enclosure and fume extraction should also be cleaned.

Fast Starts

Contacting *MultiCam*

For Sales questions or concerns, please direct all necessary email correspondence to the following address:

sales@multicam.com

Customers with technical questions about their ***MultiCam*** equipment should refer to their User Manual first. Any caller with questions regarding an issue that is clearly defined in the manual will be directed back to the manual by the Service Technician.

If the customer is unable to find the answers in the User Manual, he or she may contact the local ***MultiCam*** distributor. If the customer still has questions, he or she may contact ***MultiCam*** by phone, fax, or email.

When placing a service call, customers should include the model number of the laser, serial number of the machine, and full name of the company.

MultiCam Headquarters
1025 West Royal Lane
DFW Airport, TX 75261
USA

Mailing Address:
PO Box 612048
Dallas, TX 75261
USA

Phone: (972) 929-4070
Fax: (972) 929-4071
www.MultiCam.com

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Maintenance

The ***MultiCam*** Laser will provide years of productive service if it is maintained properly. Lasers should be de-energized prior to maintenance, and this process may take between a few minutes and an hour depending on the power of the laser. There are daily, weekly, monthly, quarterly, and yearly maintenance steps required for each machine based on a 40-hour work week. ***MultiCam*** recommends that any laser used in excess of 40 hours a week should have the maintenance schedule adjusted accordingly.

Daily

The ***MultiCam*** Laser should be cleaned off each day, and the water lines should be inspected. All dust or slag should be blown or vacuumed off the machine. Close attention should be paid to the rack area since dust or slag build-up in the rack can cause stalling problems. Operators working with systems with a Lead Screw Z-axis should lubricate the screw with a non-aerosol, silicon-based lubricant. Operators should **not** use WD-40 on the Z-axis screw for lubrication. Using anything other than what is recommended will result in the premature wear of the Z-axis screw. With Ball Screw systems, oil or lithium grease is an acceptable lubricant.

Weekly

The ***MultiCam*** Laser system should be cleaned thoroughly each week. The filter on the control box should be vacuumed. Any build-up in the racks or rails should be blown out. The filter or filters on the auxiliary equipment systems should be removed and cleaned. All fluid levels (if applicable) in the auxiliary equipment system should be checked and filled if needed.

Bi-Monthly

Operators should grease all the linear bearing cars at least twice a month for the ***MultiCam*** Laser. Jogging the machine while applying slight pressure in the opposite direction will help force the grease into the bearing cars and incorporate the grease throughout all of the bearings.

Monthly

The racks and Y- and Z-axis screws should be cleaned with a scrub brush and degreaser once a month following the same lubrication procedure described earlier in addition to the daily and weekly cleaning for all ***MultiCam*** Lasers. Once the racks are clean, operators should apply a bead of the lithium-based grease.

Quarterly

The X- and Y-axis covers should be removed from the ***MultiCam*** Laser every 3 months so that operators can inspect the transmission or gearboxes for wear. Operators can engage the pinion all the way into the rack by loosening the mounting bolts of the transmission or gearbox and pushing the assembly up. The tabletop bolts should be checked to ensure they are all tight.

Bi-Annually

The electrical cabinet should be checked during the bi-annual maintenance performed on the ***MultiCam*** Laser, and operators should wear cloth or lint-free gloves when working with electrical components. Operators should lockout incoming power before opening the cabinet and then vacuum out any debris that may have entered the cabinet during regular working conditions. Operators should **not** use compressed air when cleaning out the cabinet as this action may cause unwanted particles to short out some of the electrical components.

MultiCam recommends that the belts on all transmissions and Lead Screw Z-nuts be replaced every other year.

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Maintenance Log

Date	*Support Personnel*	*Maintenance Performed / Recommendations*

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Warranty for Lasers

MultiCam hereby warranties the electronics, motion controller, and motors of the laser, when properly used per the original design function, to be free of defects for a period of one (1) year from the date of shipment from ***MultiCam***. This warranty is provided to assure the initial purchaser that the machine and control units are free from defects in workmanship and materials. No responsibility for loss of machine time or work piece is expressed or implied. This warranty is valid to the original owner while in compliance with normal usage and the recommended maintenance as prescribed by the manufacturer. Failure to perform regularly scheduled maintenance and maintain the maintenance log will void this warranty.

If the electronics, motion controller, or motors of the laser are found to be defective during the applicable warranty period in accordance with the following specific procedure, ***MultiCam*** will, at its option, either repair or replace the parts at no charge. Replacement parts may be refurbished. All parts that are replaced shall become the property of ***MultiCam***. This warranty does not include the following items:

particulate filters	timing belts	hoses
tooling	dust brushes	items consumed in normal use

Also excluded from the warranty is any damage to the laser resulting from, but not limited to, shipping, accident, disaster, misuse, abuse, or any unauthorized modification of the product. ***MultiCam*** makes no other warranty or representation of any kind, express or implied, and all implied warranties of merchantability and fitness for a particular purpose with respect to the equipment are disclaimed.

Specific Warranties

Lasers

See the manufacturer's warranty for the specific laser.

Fume Extraction

See the manufacturer's warranty for the specific fume extraction apparatus.

Limited Warranty Procedures

USA

Customers must first contact their local authorized ***MultiCam*** Technology Center to issue a purchase order, which is required for any parts that must be returned to ***MultiCam***. When replacement parts are shipped, an RMA number/tag will be included and must be prominently displayed on the outside of the return package as well as on the accompanying packing slip. All parts must be returned within 21 days, or the invoice for the parts will be due. The customer assumes cost of shipment for returned items. ***MultiCam*** will not issue Call Tags for any machine part or equipment.

Outside the USA

Please contact the local ***MultiCam*** Distributor for specific instructions.

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Warranty Registration List

The following documents must be returned to ***MultiCam*** in order for the warranty to be registered. Some documents may not apply to every ***MultiCam*** Laser.

* Laser Warranty Card
* Laser Chiller Warranty Card
* Fume Extraction Warranty Card
* MultiCam CNC Cutting System Warranty Card

These documents should be faxed or mailed to ***MultiCam*** within 30 days of the machine delivery and installation with the machine model and serial number, as well as the company information, included in the correspondence.

Fax Number: (972) 929-4071

Mailing Address:

MultiCam
Attn: Warranty Registration
PO Box 612048
Dallas, TX 75261

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Keypad and Functions

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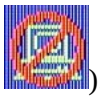
Handheld Keypad

The ***MultiCam*** graphical keypad provides more flexibility in accessing the Laser by allowing the operator to be closer to the work surface when setting up jobs. With the mobility of this unit, operators experience fewer problems pressing wrong keys by maintaining visual contact with the keypad. The display also allows for the standard 4 lines of text at the top of the screen to indicate the machine status as well as a graphical depiction of the cut file.

Shift Mode is indicated by the arrow at the bottom right (i.e., Normal Mode , Shift Mode).

The computer connection is also indicated at the bottom right (i.e., connected , not connected ).

Operators may press the X-axis Down Jog Arrow to view additional menu items in the various menus available on the keypad.

The keypad also provides direction with the color scheme: Blue keys indicate adjustments and settings; Green keys indicate action or movement; and the Yellow key indicates caution or pause. The Emergency Stop (E-Stop) red button located at the top of the keypad allows the operator to immediately shut down or discontinue the current job.

Keypad

Emergency Stop (E-Stop)

Pressing Emergency Stop (E-Stop) on either the handheld keypad or at the side of the gantry cuts power to everything except the control board of the unit, which will go into Emergency Stop mode and cut power to the inverter. This causes the spindle to coast to a stop, a process that may take several minutes. All job setup information is erased from the system, and operators should wait at least 2 minutes before engaging the machine and applying power to the motors. The E-Stop button must be pulled out when the main power switch is turned on.

Keypad

Hot Keys for the Laser

Hot Keys are the keys on the ***MultiCam*** Handheld Keypad which access functions without using the Menu System. The operator can access different aspects of the system using the Hot Keys, which are listed under Normal Hot Key Functions and Shifted Hot Key Functions.

Normal Hot Key Functions *(as shown on keypad)*

Go Home	Feedrate Up	Jog Z Up	Increase Power	Pause
Set Surface	Feedrate Down	Jog Z Down	Decrease Power	Start
Set Home	Move (7)	Jog Up (8)	Single Fire (9)	Menu
Material Library	Jog Left (4)	5	Jog Right (6)	Shift
DNC	Bar Code (1)	Jog Down (2)	Drive Enable (3)	Cancel (Exit)
Jog Speed	Help (+/-)	0	Soft Homes (.)	Enter

Additional hot key features can be accessed when the keypad buttons are pressed in combination with Shift .

Shifted Hot Key Functions

Find Home		Park Z Up		
Change Material Thickness		Park Z Down		Proximity Restart
Return to Home 0		Park X High	Gas Pressure Test	
	Park Y High		Park Y Low	
		Park X Low	Drive Disable	
	Controller Info		Set Soft Homes	

Go Home

The Go Home function is a return to the current 0,0 soft home and Lift Height. The coordinates can be modified, but most operators prefer using soft homes for establishing different home coordinates during the cutting process.

Press Go Home .

Hot Keys Keypad

Feedrate Override

The Feedrate Override function allows the operator to adjust the X,Y travel of the machine and to change speeds from as little as 10% to as much as 100%. This affects the feedrate or cut speed when the laser is moving through the material. The Feedrate Override has no effect when the machine is executing a rapid move above the material. The cut speed will be shown on the keypad display as a percentage of the actual speed: *Feed%= ###*. The Feedrate Override determines the percentage by which the operator adjusts the cut speed.

1. Press Feedrate Override to adjust the feedrate in 1% increments when a file is being executed on the machine.
2. Hold Feedrate Override to adjust the feedrate in faster moving 1% increments when a file is being executed on the machine.

Hot Keys Keypad

Jog Z-axis

1. Press and hold Z-axis Up Jog Arrow or Z-axis Down Jog Arrow to raise or lower the head assembly.
2. Press Jog Speed to increase or decrease the Jogging speed of the head assembly.

Hot Keys Keypad

Increase / Decrease Power

The Increase/Decrease Power Override allows the operator to control the percentage of laser power being used. The actual power used depends on the specific laser. The laser power can be adjusted while a file is being executed, and the current laser power will be shown on the keypad display as *Pwr=####*.

The laser power will be set to the new value whenever the system receives a new laser power command, either automatically while a file is being executed or manually when the operator uses the Hot Keys.

1. Press Increase/Decrease Power to adjust the laser power by 1% increments.
2. Hold Increase/Decrease Power to adjust the laser power by faster moving 1% increments.

Hot Keys Keypad

Pause

The Pause function allows the operator to instantly stop any motion of the machine or any file. The Z-axis will move to the Lift Height position, and the spindle will shut off. At this point, the operator can change any 2D cutting parameters or Jog the spindle out of the way to get a better look at the cut. When “Continue” is selected, the machine will automatically return to the position before Pause was activated and continue with the commanded motion or the file.

1. Press Pause to stop the machine for any reason.

2. Press Jog Arrows until the blinking cursor is over the first letter of the command to be executed.
   a. **Continue** finishes out the operation or file originally executed.
   b. **Cancel** ends the operation or file executed and shows *Motion Cancelled…* on the keypad display.
   c. **Jog** allows the operator to Jog the machine to any location within the table parameters.
   d. **Params_2D** allows the operator to make any quick changes in the 2D cut parameters.

3. Press Enter to accept the command.

Hot Keys Keypad

Set Surface (Z=0)

The Set Surface function allows the operator to identify and set the surface of the material or the software Z reference point as the Z-axis Home (Z=0). Once set, the surface will not have to be reset unless the system is shut off or the material thickness changes.

1. Make sure the fume extraction is on. The fume extraction will hold the material down so that the laser can read the surface dimensions properly.

2. Press Jog Arrows to position the center of the head assembly anywhere over the material.

3. Press Set Surface .

4. Enter the material thickness (e.g., 0.20). The display will prompt the operator to set the surface.

5. Press Z-axis Jog Arrows
   a. Ferrous metals or machines with capacitive height sensors
   to lower the Z-axis until the head assembly is approximately 1/4” above the material.

   b. Non-ferrous metals or machines without capacitive height sensors
   to position the surface sensor over the material to be cut.

6. Press Zero to begin the surfacing routine.
   a. Ferrous metals or machines with capacitive height sensors
   This will cause the Z-axis to move down slowly until the tool comes in contact with the surface block and then move up above the surface block to the Lift Height.

   b. Non-ferrous metals or machines without capacitive height sensors
   This will cause the Z-axis to move down slowly until the surface sensor comes in contact with the surface block and then move up above the surface block to the Lift Height.

Hot Keys Keypad

Start

Pressing Start will begin a job file or execute a Cut Utility. When a file has been completed, the operator can press Start to activate the replay buffer and begin the file again. Operators should never leave the machine unattended during the cutting sequence.

Hot Keys Keypad

Set Home (0,0)

The Set Home function allows the operator to identify the exact location of X=0, Y=0 on the material to be cut. This is the Soft Home location 0. The file that is to be executed on the table will use this location as the software reference point home or origin (0,0): the machine will begin and return to this new origin, and the X and Y coordinate locations are stored in the controller's memory.

The location of the Set Home position will be the new origin (0,0) until a new home is set or the current home is cleared by selecting Clr_Home from the Utility sub-menu. The software reference point **must be** the material home point.

1. Press Jog Arrows to place the **center of the head assembly** over the front right corner of the material.
2. Press Set Home .

3. Press Enter to accept. This will store the absolute X and Y coordinate locations in the controller's memory.

Hot Keys Keypad

Move

The Move function allows the operator to enter exact values for X, Y, or Z (0,0,0) where the first entry is X (length), the second entry is Y (width), and the third entry is Z (height). The X, Y, and Z values will reference from the Hard Home position until the Set Home and Set Surface functions have been selected. At that point, the X- and Y-axes will reference from the Set Home position. The Z value will reference from the surface of the material.

1. Press Move

.

2. Enter the desired value for X using the number keypad (e.g., 4.0).

3. Press Enter to accept the value.

4. Enter the desired value for Y using the number keypad (e.g., 4.0).

5. Press Enter to accept the value.

6. Enter the desired value for Z using the number keypad (e.g., 0.0).

7. Press Enter to accept the value.

8. Press Enter when the "?" is displayed to accept all settings and move the machine to the new coordinates.

9. Press Cancel to return to the main display.

The Move function can also be used to verify a specific location.

1. Press Move

.

2. Press Enter 3 times to verify the current location of the X-, Y-, and Z-axes.

   The operator should press Enter to keep the axis value from changing when that value is shown on the screen.

Hot Keys Keypad

Jog X- and Y-axes

The Jog Arrows

are used to Jog the location of the head assembly and to move through the menu. Jog Speed can be pressed to change the Jogging speed of the machine.

1. Left Arrow

is the Y-axis Positive Jog Key and Left Scroll Key in the menu.

2. Up Arrow

is the X-axis Positive Jog Key and Line Up Key in the menu.

3. Down Arrow

is the X-axis Negative Jog Key and Line Down Key in the menu.

4. Right Arrow

is the Y-axis Negative Jog Key and the Right Scroll Key in the menu.

Hot Keys Keypad

Single Fire Laser Test

The Single Fire Laser Test function allows the operator to test the controller output to the laser. The laser will be activated at the percentage of power entered and for the duration entered.

1. Press Single Fire Laser Test . The keypad display prompts for the percent power for the test, and the current percent power is displayed.

2. Enter the desired percent power using the number pad (e.g., 17).

3. Press Enter to record the percentage value. The keypad display prompts for the pulse duration.

4. Press Enter to record the pulse duration value. The keypad display shows the settings and prompts to start or exit the test.

5. Press Start to turn the laser on and begin the test. The keypad display will show when the laser is on or off.

6. Press Cancel to exit the test and return to the main display.

Hot Keys Keypad

Menu

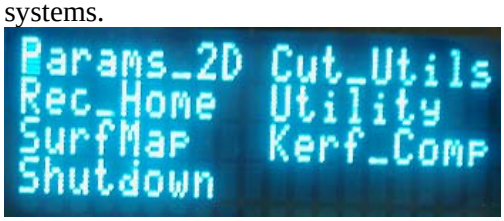
Menu Items help the operator handle many of the functions of the ***MultiCam*** Laser by providing the ability to set feedrates and other parameters, run tests, and cut basic shapes. With the addition of some advanced features of the ***MultiCam*** Laser, the operator can also adjust tools or duplicate shapes which create G-Code files quickly.

1. Press Menu

to access the menu system.

2. Press Jog Arrows

until the blinking the cursor is over a specific menu item. Certain menu items will then pull up a sub-menu with more selection. Not all menu items will be applicable for some systems.



Hot Keys Keypad

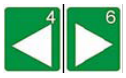
Material Library

The Material Library function allows operators to review the preset parameters for various materials. Operators may select the material type, current amperage, material thickness, and maximum or optimum cut, and the parameters will be automatically retrieved from the integrated database and stored in Params_2D to provide a starting point. Any adjustments can be made to suit the operating conditions.

1. Press Material Library .

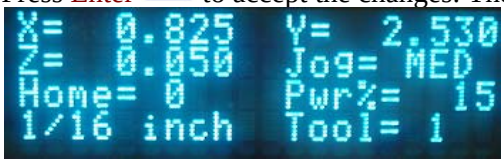
2. Press X-axis Jog Arrows to position the cursor over the appropriate selection (e.g., Cardboard).

3. Press Enter to access the material.

4. Press Y-axis Jog Arrows  to position the cursor over the parameter to be changed.

5. Press X-axis Jog Arrows to change that value.

6. Press Enter to accept the changes. The modified information will be displayed on the main screen.



Hot Keys Keypad

Shift

Pressing Shift before pressing any desired Hot Key will allow the operator to toggle between **Normal Hot Key** and **Shifted Hot Key** functions.

When Shift has been pressed, the Shift LED will illuminate to indicate that the keypad is now in *Shifted Mode*.

Hot Keys Keypad

DNC

The Distributed Numerical Control (DNC) function allows the operator to access files directly from the hard drive of the host PC by using the keypad at the machine. This allows the computer and the machine to be in different locations, which frees up the operator to view the progress of the cutting sequence. Additional information on DNC and JobServer can be found in the Software Section of this manual.

1. Make sure that JobServer or JobNameServer has been activated on the computer before selecting this function.

2. Press DNC .

The keypad will display a list of the directories in the DNC path after the system has validated and verified.

3. Press Jog Arrows to move the blinking cursor over the directory to be entered.

4. Press Enter . The keypad will display the DNC files that are available in that directory, and directories or folders and any associated subfolders are displayed between brackets [ ]. Press Enter while the blinking cursor is located over the 2 decimal points at the beginning of the directory to return to the list of directories if necessary.

5. Press Jog Arrows to move the blinking cursor over the first letter of the file to be executed.

   Z-axis Jog Arrows will page up or down one screen at a time, while X-axis Jog Arrows will move up or down one line at a time.

6. Press Start .

If the operator just presses Enter over the blinking cursor, he or she will only receive a display of the file name, size, and date/time created.

7. Press one of the following Hot Keys to execute the required command or press X-axis Down Jog Arrow once to access the Dry Run function and once more to access the Step and Repeat function.

a. Start will execute the selected job file.

b. Cancel will end the selected job file.

c. Pause will allow the operator to change a tool, set up a 2D parameter, or set surface or max depth while holding the file in queue.

Once the file has completed running, the keypad display will show how long the selected file ran and will automatically return to the directory.

Hot Keys Keypad

Bar Code

The Bar Code function allows the operator to scan a label with the bar code scanner, which will automatically call up and download the correct job for execution on the machine, and is an option on ***MultiCam*** Lasers.
In addition, ***MultiCam*** provides JobPreviewer to print bar code labels and tool path previews with operator notes. The Bar Code Scanner is limited to 48 characters excluding the initial DNC path that is set up in JobPreviewer or JobServer (e.g., C:\DNCfiles\).

1. Press Bar Code to execute the Bar Code function. This will set the display to show when the system is bar code ready.

2. Depress the trigger on the bar code scanner and scan the bar code label printed on the JobPreviewer sheet.

   Example Only:

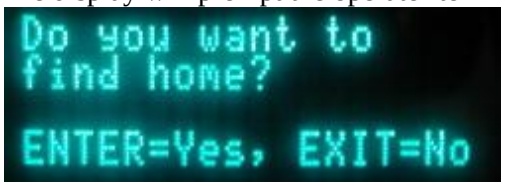
3. Press Start when prompted to begin the job.

Hot Keys Keypad

Drive Enable

1. Press Drive Enable to enable all Servo Drives after a system error.

   The display will prompt the operator to find home after re-enabling the motor drives.

2. Press Enter to ensure proper machine operation.

Hot Keys Keypad

Cancel

Press Cancel to cancel or exit any selected function or menu item. In some cases, this needs to be pressed twice to make sure the function has been completely canceled. Hot Keys Keypad

Jog Speed

Press Jog Speed to toggle between 3 different speeds at which the machine can Jog the ***MultiCam*** Laser. The keypad display will prompt the operator with *Jog = FAST*, *MED*, or *SLOW*. These words show the rate at which the machine will Jog. Hot Keys Keypad

Help

The Help function allows the operator to learn the functions of any Hot Key selected. There are 2 modes of the Help function: *Normal* and *Shifted*. In *Normal* mode, the operator can review the standard function of any Hot Key on the display. In *Shifted* mode, the operator can review the second or shifted function of that key on the display.

1. Press Help to access the Hot Key Help Feature.

2. Press any key for a brief description of that key in *Normal* mode.

3. Press Shift and any key for a brief description of that key in *Shifted* mode.

4. Press Cancel twice to exit help. Hot Keys Keypad

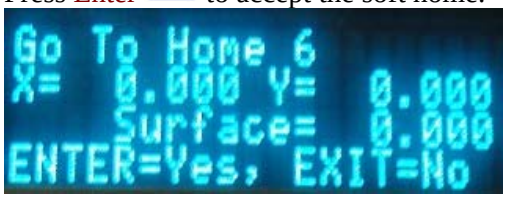
Soft Homes (.)

The Soft Homes function allows the operator to have multiple fixture setups to be quickly accessed during the cutting procedure. This button also allows the operator to input a decimal into a numeric value.

1. Press Soft Homes (.) .

2. Enter the appropriate number (1-9) to assign the proper value for the new home position (e.g., 6).

3. Press Enter to accept the soft home.



The display will acknowledge that the particular home position has been selected.

4. Press Shift and Soft Homes (.) to set new soft home locations.

Hot Keys Keypad

Enter

Press Enter to accept functions, settings, and menu items as directed. The display may provide a question mark "?" when processing certain functions. The operator can press Enter to verify that the action should take place. Hot Keys Keypad

Find Home

The Find Home function allows the operator to return each axis to the machine home position in order to relocate the homing targets. The head assembly will move to the right front of the table and index all X, Y, Z components starting with the Z-axis.

1. Press Shift and Go Home to index the gantry, carriage, and Z assembly off of the limit switches after one of the following actions has been completed:
   a. The machine has just been turned on.
   b. The machine has stalled or lost its position coordinates.
   c. The machine has been stopped because the operator pushed in E-Stop.

2. Refer to the display as it will indicate when the system locates the targets for each axis. The head assembly will be enabled when the Find Home function has been activated. Hot Keys Keypad

Park Z Up or Down

The Park Z function will move the head assembly to either the absolute Z=0 position or all the way up in a process which allows for tool changes.

1. Press Shift and Z-axis Up Jog Arrow to raise the head assembly to the absolute Z=0 position.

2. Press Shift and Z-axis Down Jog Arrow to lower the head assembly to the Lift Height position.

Hot Keys Keypad

Change Material Thickness

The Change Material Thickness function allows the operator to change the programmed material thickness.

1. Press Shift and Set Surface to access the Change Material Thickness function.

2. Enter the thickness of the material using the number keypad (e.g., 0.200).

3. Press Enter to accept the material thickness and return to the main display. Hot Keys Keypad

Proximity Restart

The Proximity Restart function is an advanced feature that allows the operator to begin a file by locating the end position based on the original Home location. The controller will search through the file to locate the nearest point and base the coordinates of the restart on the Home position from where the file was originally executed.

Proximity Restart is used any time a file is interrupted and restarting the entire file is not practical. The operator can return to the original Home position to restart the program as the configuration is based on where the cutter stopped in relation to where the cutter originally began. This command will function through the internal replay buffer of the machine.

1. Press Shift and Start from the Home position where the file was originally executed.

2. Press Jog Arrows to move the head assembly to a position within the restart tolerance of the desired point for restart.

3. Press Enter to begin the search. The keypad display will indicate the coordinates when a point within the restart tolerance is found. If no points are located within the restart tolerance, the system will default to the main display. At this point, the operator should repeat the Proximity Restart process.

4. Press Start to restart the file at the current location or press the X-axis Up Jog Arrow to access the closest point in the file. Lasers can begin just before the last cut location.
   a. If the point is located over a Tool UP Move, follow the keypad display and repeat step 3.
   b. If there is a power failure, the operator will need to re-index the machine and reset Surface and MaxDepth.

Hot Keys Keypad

Return to Home 0

The Return to Home 0 function will return the head assembly to the last recorded set home position or soft home location 0. If power has been lost or the machine was rebooted, Home 0 will become the new Hard Home.

Press Shift and Set Home.

When the Home position has been reached:

Hot Keys Keypad

Park X High or Low

The Park X function will move the head and gantry assembly to a set park position that could be as far away as the maximum length of the table or all the way back in X-axis. This allows the operator to reload material on the table or examine work without interference from the head assembly.

1. Press Shift and X-axis Up Jog Arrow to move the head and gantry assembly to the high or farthest set park position.

2. Press Shift and X-axis Down Jog Arrow to move the head and gantry assembly to the low or closest set park position.

Hot Keys Keypad

Gas Pressure Test

The Gas Pressure Test function allows the operator to test the pierce gas pressure and the cut gas pressure on laser machines.

1. Press Shift and Gas Pressure Test to begin gas pressure testing.

The double arrows show the current setting of the gas pressure test.

2. Press One to test the pierce gas or Two to test the cut gas.
3. Press Zero to turn off the pierce gas or cut gas test.
4. Press Cancel to cancel the gas pressure test and return to the main display. Hot Keys Keypad

Park Y High or Low

The Park Y function will move the head assembly the maximum length of the gantry to the right or left in Y-axis. This allows the operator to examine the work without interference from the head assembly.

1. Press Shift and Y-axis Left Jog Arrow to move the head assembly to the left side of the gantry.

2. Press Shift and Y-axis Right Jog Arrow to move the head assembly to the right side of the gantry.

Hot Keys Keypad

Drive Disable

The X-, Y-, and Z-axis drives will be disabled in the event of a system failure or a mechanical obstruction to prevent possible damage to the individual drives. The operator also has the ability to disable the drives from the keypad. Once the drives have been disabled, the machine cannot be operated by using the keypad.

Press Shift and Drive Enable to disable all drives.

When the drives associated with servo systems are disabled, the power to the motors is also disabled. The motors associated with stepper systems still have power after the drives are disabled, but there is no output from the control board.

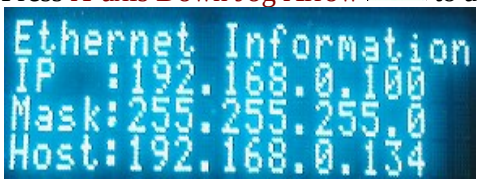
Hot Keys Keypad

Controller Information

The Controller Information function provides information on the versions of software that are loaded in the controller.

1. Press Shift and Help to display the controller information. This includes the version of machine Init files and firmware, as well as the types of Interface and Control boards.

2. Press X-axis Down Jog Arrow to access Ethernet information while viewing the controller information.



3. Press DNC to change the IP address if necessary.

Hot Keys Keypad

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Set Soft Homes

The Set Soft Homes function allows the operator to establish 9 programmable soft home positions to record multiple home positions that can be used in supporting multiple cutting fixtures. These homes stay recorded in memory even after power has been removed from the system.

1. Press Jog Arrows to position the **center of the head assembly** where the new Soft Home location should be set.

2. Press Jog Speed to change the Jogging speed if necessary.

3. Press Shift and Soft Homes .

4. Enter a number between 1 and 9 using the number keypad (e.g., 3). If the operator wants to save the Z value in the Soft Home, he or she should contact a ***MultiCam*** technician for assistance.

5. Press Enter to record the new Soft Home.

Hot Keys Keypad

Advanced

Advanced Hot Keys are accessed by pressing Shift, Help, and keypad numbers 1-9. The operator will be in the main information screen upon pressing the Shift and Help sequence the first time.

Main Information Screen

Line 1: Init File Versions
Line 2: Firmware Version
Line 3: Controller and Interface Board rev and ID
Line 4: Keypad version

Ethernet Information Screen

Line 1: “Ethernet Information”
Line 2: IP Address
Line 3: Net Mask
Line 4: DHCP Server Address (Only shows up if DHCP enabled)

Press DNC from this screen to be prompted to enable DHCP or specify an IP address.

Power Information Screen

Line 1: “Power Information”
Line 2: Incoming 24V Power to the Board
Line 3: “Recorded Power”
Line 4: “Glitches:” <number of glitches> If this number exceeds 6, a job will stop with a power failure.

Drive Temperature Information Screen

The drive temperature information is only applicable to HP4 systems.
Line 1: “Drive Info” Peak Temperature
Line 2: X Drive Temperature, Y Drive Temperature
Line 3: Z Drive Temperature, Xb Drive Temperature
Line 4: Bus Voltage

Inputs Information Screen

Each column shows the status of the specific limit.

- 0 = off
- 1 = on

Machine Information Screen

Line 1: “Machine Information”
Line 2: Model and Type
Line 3: Serial Number

Keypad

Advanced Features

Advanced Features help the operator to be more productive by previewing a file before cutting the material with Dry Run, rotating a file to match the angle of the sheet with Rotate File, cutting an entire sheet of shapes using the Step and Repeat function, accessing the bar-coded information with the Bar Code Scanner, using the Safety Mat as an option for pausing the cutting sequence, determining the status of the laser through the Status Light Bar, and maximizing the cutting time by creating 2 separate work areas on the same machine with Dual Start.

Keypad

Dry Run

The Dry Run function is an advanced feature that allows the operator to preview the file to be cut. The file will run at full speed, but the system allows the operator to slow down the Dry Run process by leaving the feedrate override active. The spindle will stay in the Tool UP position, never entering the material. The keypad displays *Tool 1 Up* when the cutter would normally be in the UP position moving between contours. The keypad displays *Tool 1 Down* when the cutter would normally be in the material cutting the contours. This command will function through the DNC or through the internal replay buffer of the machine.

1. Make sure that JobServer or JobNameServer has been activated on the computer.

2. Press DNC . The keypad display will show a list of the directories in the DNC path.

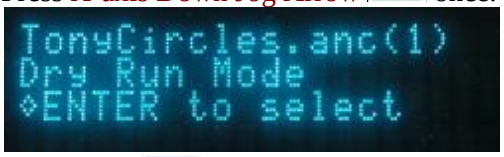
3. Press Jog Arrows until the blinking cursor is over the directory to be entered.

4. Press Enter . The keypad will display the DNC files that are available in that directory, and directories or folders and any associated subfolders are displayed between brackets [ ]. Press Enter while the blinking cursor is located over the 2 decimal points at the beginning of the directory to return to the list of directories if necessary.

5. Press Jog Arrows until the blinking cursor is over the first letter of the file to be executed.

6. Press Start .

7. Press X-axis Down Jog Arrow once.



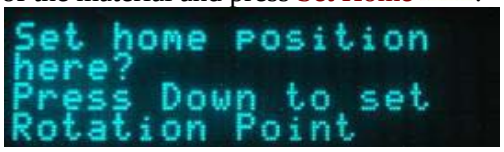
8. Press Enter to start the Dry Run process. The operator can press Cancel to abort the selected job file or Pause to change a tool, set up a 2D parameter, or set surface or max depth while holding the file in queue.

Advanced Keypad

Rotate File

The Rotate File function is used to rotate the program to match the material. Operators may find it impractical to square material sufficiently when heavy materials are loaded onto the table, so this function allows the machine to adjust the parameters of the job file.

1. Press Jog Arrows to position the **center of the head assembly** over the rear right corner of the material and press Set Home .



2. Press the X-axis Down Jog Arrow to set the Rotation Point. The keypad will briefly display the rotation setting and then switch back to the main display.

3. Press Start to begin the job file. The operator will be prompted to accept or reject the rotation.

Advanced Keypad

Step and Repeat

The Step and Repeat function is used to make a single job file cut multiple times. Operators can program a single part of the cutting sequence and include the size of the material to be cut without having to create a larger file with a detailed description of parts and motions.

1. Make sure that JobServer or JobNameServer has been activated on the computer.

2. Press DNC . The keypad display will show a list of the directories in the DNC path.

3. Press Jog Arrows until the blinking cursor is over the directory to be entered.

4. Press Enter . The keypad will display the DNC files that are available in that directory, and directories or folders and any associated subfolders are displayed between brackets [ ]. Press Enter while the blinking cursor is located over the 2 decimal points at the beginning of the directory to return to the list of directories if necessary.

5. Press Jog Arrows to move the blinking cursor over the first letter of the file to be executed.

   Z-axis Jog Arrows will page up or down one screen at a time, while X-axis Jog Arrows will move up or down one line at a time.

6. Press Start to access the particular file.

   If the operator just presses Enter over the blinking cursor, he or she will only receive a display of the file name, size, and date/time created.

7. Press X-axis Down Jog Arrow twice to access the Step and Repeat function.

8. Press Enter to start the Step and Repeat function.
9. Enter the sheet size in X-axis using the number keypad (e.g., 119.565) and press Enter.

10. Enter the sheet size in Y-axis using the number keypad (e.g., 48.690) and press Enter.

11. Enter the space between the parts using the number keypad (e.g., 0.500) and press Enter.

12. Press X-axis Jog Arrows to select whether the machine should step along the X- or Y-axis.

13. Press X-axis Jog Arrows to select Yes or No for the Serpentine option.

If X-axis is selected above and serpentine is selected next, then the machine will cut the parts in a line down the X-axis, move over in the Y-axis, and cut back up the X-axis. This sequence of motions increases efficiency since the machine will not make a big slew move back to the front of the machine after each row of parts.

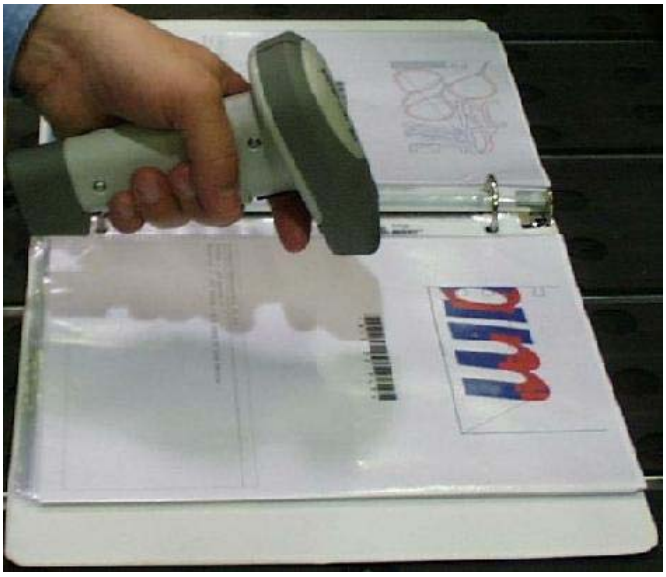
14. Press Enter to start the cutting sequence.

Advanced Keypad

Bar Code Scanner

The ***MultiCam*** Bar Code Scanning Interface has been developed to reduce setup time, minimize errors, and work directly with shop floor work orders. The bar code scanner works in direct conjunction with the JobPreviewer and DNC. The JobPreviewer is used to produce shop floor work orders, which are automatically assigned unique bar code identifications. Once the operator scans the bar code, DNC will automatically call up the correct file and send it to the controller. This saves time and reduces the chance for error.

An excellent tool for communication of special instructions, the work order contains a graphical representation of the cut file, tool specifications, material descriptions, and user notes. The bar code label on the work order ensures that the correct job is accessed.



Advanced Keypad

Safety Mat

The Safety Mat is a pressure-sensitive foot mat that will cause the machine to enter into Pause mode when the mat is stepped on during machine operations. This Pause mode can only be cleared by pressing the “Safety Mat Reset” switch at the operator station and then clearing the error at the keypad.

MultiCam advises operators to pause operations during any changing of tools or materials and recommends that operations be paused when any disruptive action (e.g., change of shift, emergency situation) occurs in the cutting area. All cutting operations should be stopped and the machine turned off before any maintenance issues are addressed.

Advanced Keypad

Status Light Bar

The Status Light Bar contains 3 colored lights of Red, Amber, and Green and is located on the electrical cabinet and the operator station. Each color has a specific meaning that indicates the current status of the machine. Operators and other personnel in the general area should remain aware of the current status so as to prevent any damage to personnel or the machine.

Color	*Meaning*
Red	The laser is firing.
Blinking Red	An error has occurred during the cut, and the laser may not be firing.
Amber	The laser is in maintenance mode. No firing can be completed.
Green	The shutters are closed, and the laser will not fire.

Advanced Keypad

Dual Start

The Dual Start function is available with most CNC systems and requires an Operating (op) station with options for Home 1 and Home 2. Operators who run the same job several times in a row may choose the Dual Start option to maximize the table space and increase productivity.

1. Make sure the Dual Start Module has been loaded on the machine.

2. Set Parameter 24 to 1.

3. Set Soft Homes **1 and 2**. The system will automatically recognize that Dual Start is being requested. Other Home values will not work.

   a. Press Jog Arrows to position the **center of the head assembly** where the first Soft Home location should be set.

   b. Press Shift and Soft Homes .

c. Enter 1 for Home 1 and press Enter to record the Soft Home.

d. Press Jog Arrows to position the **center of the head assembly** where the second Soft Home location should be set.

e. Press Shift and Soft Homes.

f. Enter 2 for Home 2 and press Enter to record the second Soft Home.

4. Press DNC.

5. Press X-axis Jog Arrows until the blinking cursor is over the appropriate job file.

6. Press Enter to access the job file.

7. Push button 1 or 2 on the op station to move the spindle to Soft Home 1 or 2.

8. Press Start to begin the file.

9. Press the other button on the op station to run the same job at the other Soft Home location after the first job file has been completed. Operators should make sure the material has been properly loaded at the other location before beginning the job file at that location.

Advanced Keypad

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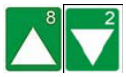
Params_2D

The Params_2D sub-menu is used to set machine parameters specific to a machine equipped with a laser. The display extends 4 rows, so the operator must Jog down to see additional menu items. These sub-menu items allow the machine to be set to certain specifications for cutting different materials or removing waste material.

The default settings for the current material are read from the Material Library. If any values are changed, the operator is prompted to update and change the library with the new values. Some of these settings may not apply to all Laser systems.

1. Press Menu

to access the menu system.
2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.
3. Press Enter
to access the Params_2D sub-menu.
4. Press X-axis Jog Arrows

until the appropriate option is highlighted in blue. Certain menu items will then enter a sub-menu with more selections.

Pen Number
X,Y Feedrate
Cut Power
Cut Height
Lift Height
Pierce Gas Delay
Cut Gas Delay
Pierce Power
Pierce Time
Power Control
Min Power
VPPI
Min. PWM Factor
Bidir Coef.
Contrast
Brightness
Kerf Diam.
Kerf Overlap
Laser Freq.
Cont. Wave
Z Tracking
Tactile Sensor
THC Delay
Settings
Update Material Library

Menu

Pen Number

The Pen Number function is used to output a file to the machine with multiple tool path attributes in a manner similar to using different tool numbers when creating a router program. The default settings are shown below:

* Pen 1—Cutting
* Pen 2—Engraving
* Pen 16—Rastering

1. Press Menu

to access the menu system.
2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.
3. Press Enter to access the Params_2D sub-menu.
4. Press X-axis Jog Arrows

until Pen Number is highlighted in blue.
5. Press Enter to change the pen number. ***MultiCam*** recommends that operators not adjust the default settings without direction from a service technician.

Params_2D Menu

X & Y Feedrate (Cut Speed)

The X & Y Feedrate refers to the rate, measured in inches per minute (IPM), that the tool will travel in the X, Y direction through the material while the tool is in the PD position (i.e., the Cut Speed). These speed settings will vary with the type of material used.

The Cut Speed function can only be used when **no** feedrate has been programmed in the NC file. The machine will default to 15 IPM if the machine loses power or the controller is rebooted.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

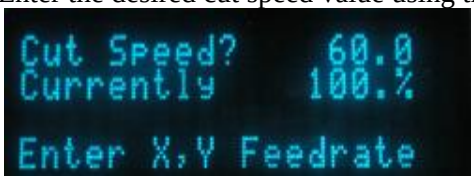
3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Cut Speed is highlighted in blue.

5. Press Enter to adjust the cut speed.

6. Enter the desired cut speed value using the number keypad (e.g., 60).



7. Press Enter to record the value and return to the Params_2D sub-menu.

Params_2D Menu

Cut Power

The Cut Power function is used to set the percentage of the laser power for the machine use during the cutting sequence. The actual power used depends on each specific laser, and the maximum power is also dependent on the type of laser (e.g., 400 watts is the maximum power for a 400 watt laser).

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Power is highlighted in blue.

5. Press Enter to adjust the Power.

6. Enter the percent of power using the number keypad (e.g., 10).

7. Press Enter . The display returns to the Params_2D sub-menu.

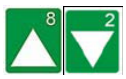
Params_2D Menu

Cut Height

The Cut Height function is used to set the distance the cutting tip will operate above the surface of the material on a cutting move.

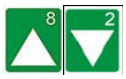
1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows 

until Cut Height is highlighted in blue.

5. Press Enter to adjust the Cut Height.

6. Enter the Cut Height using the number keypad (e.g., 0.100). A positive value will raise the focal point above the material surface, and a negative value will lower the focal point below the material surface.

7. Press Enter . The display returns to the Params_2D sub-menu.

Params_2D Menu

Lift Height

The Lift Height function is used to set the distance the tool will rise above the surface of the material between cuts and is only applicable for controller functions, such as Go Home and Matl_Cut, as well as G-Code programs and HPGL programs with no Lift Height included.

The Lift Height allows the tool to travel above and across the material and can be modified after the surface is set. The Go Home function will move the Z-axis to the new Lift Height position.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Lift Height is highlighted in blue.

5. Press Enter to adjust the Lift Height.

6. Enter the Lift Height using the number keypad (e.g., 0.500).

7. Press Enter to record the Lift Height value. The number entered should be a positive number, but the display will show it as a negative number since movement up from the surface is considered negative while movement down from the surface is considered positive.

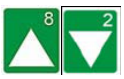
Params_2D Menu

Pierce Gas Delay

The Pierce Gas Delay function is used in conjunction with the capacitive cutting head to configure the length of time in seconds before the pierce gas is applied to the cutting head.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Pierce Gas Delay is highlighted in blue.

5. Press Enter to adjust the pierce gas delay.

6. Enter the Pierce Gas Delay using the number keypad (e.g., 0).

7. Press Enter to record the Pierce Gas Delay and return to the Params_2D sub-menu.

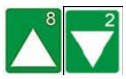
Params_2D Menu

Cut Gas Delay

The Pierce Gas Delay function is used in conjunction with the capacitive cutting head to configure the length of time in seconds before the cut gas is applied to the cutting head.

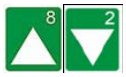
1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows 

until Cut Gas Delay is highlighted in blue.

5. Press Enter to adjust the cut gas delay.

6. Enter the Cut Gas Delay using the number keypad (e.g., 0).

7. Press Enter to record the Cut Gas Delay and return to the Params_2D sub-menu.

Params_2D Menu

Pierce Power

The Pierce Power function is used to provide the power the laser requires to completely penetrate the material.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter
to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Pierce Power is highlighted in blue.

5. Press Enter
to access the Pierce Power function.

6. Enter the power required for piercing using the number keypad (e.g., 30).

7. Press Enter
to record the Pierce Power and return to the Params_2D sub-menu.

Params_2D Menu

Pierce Time

The Pierce Time function is used to indicate the period of time the laser requires to completely penetrate the material.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Pierce Time is highlighted in blue.

5. Press Enter to adjust the Pierce Time.

6. Enter the time required for piercing in seconds using the number keypad (e.g., 0.000).

7. Press Enter to record the Pierce Time and return to the Params_2D sub-menu.

Params_2D Menu

Power Control

The Power Control function is used to indicate the period of time the laser requires to completely penetrate the material.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

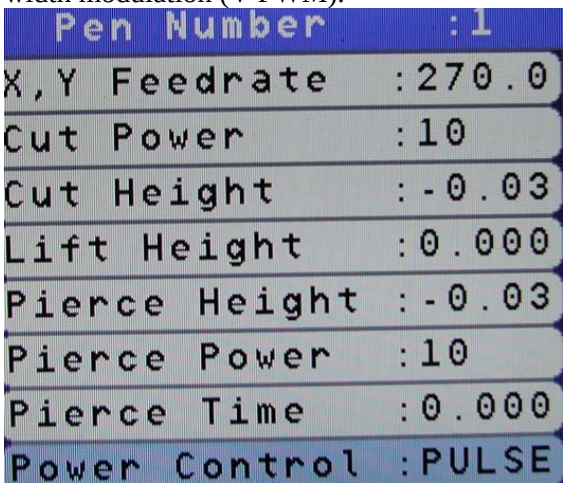
until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Power Control is highlighted in blue.

5. Press Enter to toggle the Power Control from Pulse, fixed pulse width modulation (F PWM), and variable width modulation (V PWM).



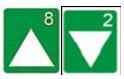
Params_2D Menu

Min Power

The Min Power function sets the minimum power wattage used to fire the laser. The maximum usage is 10 watts. Min Power only applies to the Pulsed and V PWM power control options.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

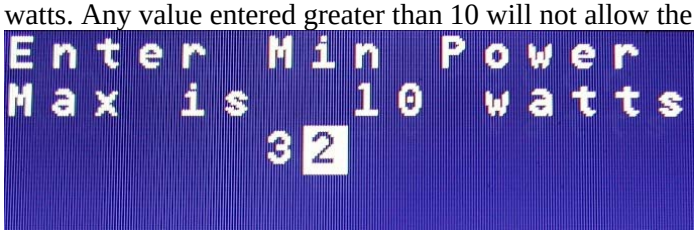
3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Min Power is highlighted in blue.

5. Press Enter to adjust the Minimum Power.

6. Enter the power value in watts using the number keypad (e.g., 0.000). The maximum minimum power is 10 watts. Any value entered greater than 10 will not allow the operator to save the setting.



7. Press Enter to save the minimum power and return to the Params_2D sub-menu.

Params_2D Menu

VPPI

The Vector Pulses Per Inch (VPPI) function is used to set the number of vector pulses issued per inch. If the operator is rastering an image, then he or she should verify that the VPPI matches the DPI of the image being rastered. During the cutting sequence, the VPPI is determined by the material.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

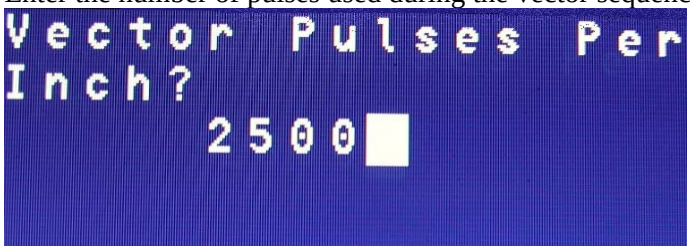
3. Press Enter
to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until VPPI is highlighted in blue.

5. Press Enter
to adjust the VPPI.

6. Enter the number of pulses used during the vector sequence using the number keypad (e.g., 2500).



7. Press Enter
to record the VPPI and return to the Params_2D sub-menu. The value entered will be shown on the display.

Params_2D Menu

Min PWM Factor

The Minimum Pulse Width Modulation (PWM) Factor is a factorial value used to maintain firing power when cutting a sharp contour in metal. The laser power is directly proportional to the speed in which the cutting head is moving, and the laser will naturally reduce power prior to a sharp contour. The Min. PWM Factor instructs the laser not to reduce power to 0 but to limit the minimum output power when cutting metals since most metals cannot be cut at a lower laser power.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Min. PWM Factor is highlighted in blue.

5. Press Enter to adjust the PWM factor.

6. Enter the desired factor using the number keypad (e.g., 0.000). The system will default to 0.080.

7. Press Enter to record the Min PWM Factor and return to the Params_2D sub-menu.

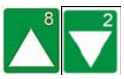
Params_2D Menu

Bi-Directional Coefficient

The Bi-Directional Coefficient function is used as an offset value to align the raster image during the rastering process in a manner similar to the alignment process of a printer.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter
to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Bidir_Coef is highlighted in blue.

5. Press Enter
to adjust the bi-directional coefficient.

6. Enter the value for the bidirectional correction using the number keypad (e.g., 4.660).

7. Press Enter
to record the Bi-Directional Coefficient and return to the Params_2D sub-menu

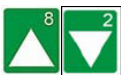
Params_2D Menu

Contrast

The Contrast function is used to adjust the contrast of the image when images are being rastered. The system automatically defaults to 50, but the operator may change this value.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter
to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Contrast is highlighted in blue.

5. Press Enter
to change the contrast value. The cursor will be over the entry for the current contrast.

6. Enter the desired contrast using the number keypad (e.g., 50).

7. Press Enter
to record the Contrast and return to the Params_2D sub-menu.

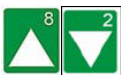
Params_2D Menu

Brightness

The Brightness function is used to adjust the brightness of the image when images are being rastered. The system automatically defaults to 50, but the operator may change this value.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Brightness is highlighted in blue.

5. Press Enter to change the Brightness. The cursor will be over the entry for the current brightness.

6. Enter the desired brightness using the number keypad (e.g., 50).

7. Press Enter to record the Brightness and return to the Params_2D sub-menu.

Params_2D Menu

Kerf Diameter

The Kerf Diameter function is used to establish the diameter of the beam while cutting.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter
to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Kerf Diameter is highlighted in blue.

5. Press Enter
to change the value.

6. Enter the kerf diameter using the number keypad (e.g., 0.000).

7. Press Enter
to record the Kerf Diameter and return to the Params_2D sub-menu.

Params_2D Menu

Kerf Overlap

The Kerf Overlap function is used to adjust the edge quality of the cut. A higher percentage of overlap yields a better cut; however, the effectiveness of this setting is determined by the material being cut and how that material responds to heat.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Kerf Overlap is highlighted in blue.

5. Press Enter to adjust the kerf overlap percentage value.

6. Enter the kerf overlap percentage value using the number keypad (e.g., 80).

7. Press Enter to record the Kerf Overlap and return to the Params_2D sub-menu.

Params_2D Menu

Laser Frequency

The Laser Frequency function is used to adjust the quality of the cut in conjunction with Kerf Overlap. A higher frequency creates more heat since the laser is on more often; therefore, materials which are more susceptible to heat damage should be cut at lower frequencies. The overall frequency range is determined by the laser model.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Laser Freq is highlighted in blue.

5. Press Enter to adjust the laser frequency.

6. Enter the laser frequency using the number keypad (e.g., 20000).

7. Press Enter to record the Laser Frequency and return to the Params_2D sub-menu.

Params_2D Menu

Continuous Wave

The Continuous Wave function is used to provide a continuous, steady current in either pulse or wave mode. A steady current is supplied with the **continuous wave on**, and a pulsed current is supplied with the **continuous wave off**. Pulsed current provides a higher peak power than continuous wave, though its average power measures close to the average power of the continuous wave. High vaporization is achieved with a pulsed current, or Continuous Wave OFF.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Cont. Wave is highlighted in blue.

5. Press Enter to toggle the continuous wave setting ON or OFF. The menu stays in Params_2D with the updated setting.

Params_2D Menu

Z Tracking

The Z Tracking function is used in conjunction with the capacitive cutting head to maintain the same distance from the cutting head to the material regardless of inconsistencies in the material (e.g., steel that is warped in the middle). The Z Tracking function is most often used with steel and other conductive materials.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Z Tracking is highlighted in blue.

5. Press Enter to toggle the Z Tracking from OFF to ON.

Params_2D Menu

Tactile Sensor

The Tactile Sensor function is used in conjunction with the capacitive cutting head and sensor to maintain the same distance from the cutting head to the material regardless of inconsistencies in the material (e.g., acrylic that is warped in the middle). The Tactile Sensor function is most often used with acrylic and other non-conductive materials.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Tactile Sensor is highlighted in blue.

5. Press Enter to toggle the Tactile Sensor from YES to NO.

Params_2D Menu

THC Delay

The THC Delay function is used in conjunction with the capacitive cutting head and sensor to adjust the torch height control (THC) delay. **THC Delay is only available if Z Tracking is enabled**.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until THC Delay is highlighted in blue.

5. Press Enter to adjust the torch height control delay.

6. Enter the desired pierce delay value from the number keypad (e.g., 5400).

7. Press Enter to record the Torch Height Control and return to the Params_2D sub-menu.

Params_2D Menu

Settings

The Settings function is used to modify the kerf width and lead in presence and status.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Settings is highlighted in blue.

5. Press Enter to change the kerf width and lead in status.

a. Kerf Width

i. Press Enter over Kerf Width.
ii. Enter the corrected value using the number keypad. Negative numbers should be used for an inside cut.
iii. Press Enter to confirm the value and return to the Settings sub-menu.

b. Lead In

i. Press Enter over Lead In.
ii. Press Enter to toggle between YES and NO.

c. Lead In Rad

i. Press Enter over Lead In Rad.
ii. Enter the Lead In Radius value using the number keypad.
iii. Press Enter to confirm the value and return to the Settings sub-menu.

Params_2D Menu

Update Material Library

The Update Material Library function is used to update the saved information that relates to the specifications of the cut and parameters of the cutting sequence.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

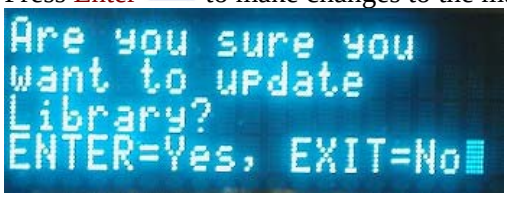
until Params_2D is highlighted in blue.

3. Press Enter to access the Params_2D sub-menu.

4. Press X-axis Jog Arrows

until Update Material Library is highlighted in blue.

5. Press Enter to make changes to the material library.



6. Press Enter to update the material library or Exit to cancel the activity and return to the main display.

Params_2D Menu

Recording a Soft Home

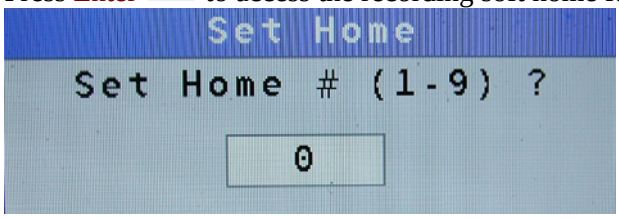
The Recording a Soft Home function is used to set up to 9 different recordable home positions that can be used to support multiple cutting fixtures. These homes stay recorded even after power has been removed from the system.

1. Press Jog Arrows to position the **center of the head assembly** where the new Soft Home location is to be set.

2. Press Menu to access the menu system.

3. Press X-axis Jog Arrows until Rec_Home is highlighted in blue.

4. Press Enter to access the recording soft home function.



5. Enter the desired number (1-9) using the number keypad to record the soft home.

6. Press Enter to accept the soft home and return to the main menu.

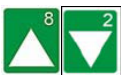
Menu

SurfMap

The Surface Map sub-menu is used to provide the operator with access to mapping the surface, especially as it relates to uneven surface materials or changes in material thickness.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until SurfMap is highlighted in blue.

3. Press Enter
to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until the appropriate option is highlighted in blue. Certain menu items will then enter a sub-menu with more selections.

Start Z Surface Mapping
Surface Mode
X Distance
Y Distance
Step Size
Z Seek Speed
Z Safe Lift
Save Surface Map
Load Surface Map
Surf. Map: Status
Move to Probe Offsets
Test I/O

Menu

Start Z Surface Mapping

The Start Z Surface Mapping function is used to map the surface of the material based on the step size, Z seek speed, and other values set in the surface map screen so that the system can familiarize itself with the various depressions and ridges of the material.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

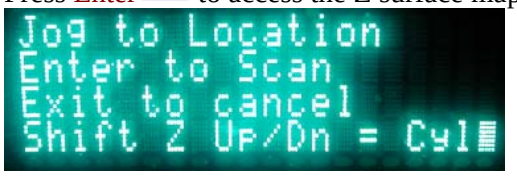
until SurfMap is highlighted in blue.

3. Press Enter
to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Start Z Surf Mapping is highlighted in blue.

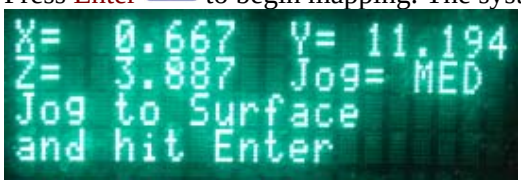
5. Press Enter
to access the Z surface map function.



6. Press Jog Arrows

to place the head assembly at the area to be mapped.

7. Press Enter
to begin mapping. The system will scan the area.



8. Press Z-axis Jog Arrows

to Jog to the surface.

9. Press Enter
to begin mapping the surface. The system will Jog to the surface several times and in several places, prompting the operator to press Enter
between scans. Once the surface has been mapped, the display will return to the SurfMap sub-menu.

SurfMap Menu

Surface Mode

The Surface Mode function is used to move between no surface mode, Surface Map, and Radius Check. The operator can access different sub-menu items for each type of surface mode, though these directions will deal with the surface mode None.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

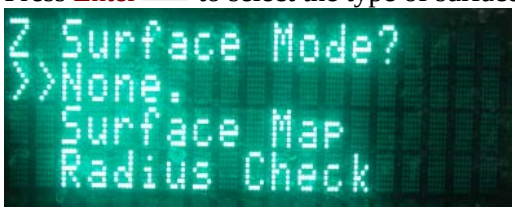
until SurfMap is highlighted in blue.

3. Press Enter to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Surf. Mode is highlighted in blue.

5. Press Enter to select the type of surface mode (e.g., None).



6. Press Z-axis Jog Arrows

to move between the types of modes. The double arrows indicate which mode is selected.

7. Press Enter to set the system for that mode. The SurfMap sub-menu will show the mode selected.

SurfMap Menu

X and Y Distance

The X Distance and Y Distance functions are used to set the limit for both axes.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

3. Press Enter
to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until X Distance or Y Distance is highlighted in blue.

5. Press Enter
to adjust the distances for either axis.

6. Enter the value for each distance using the number keypad (e.g., 5.000).

7. Press Enter
to accept the value entered and return to the SurfMap sub-menu.

SurfMap Menu

Step Size

The Step Size function is used to adjust the size of the steps taken during scanning.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

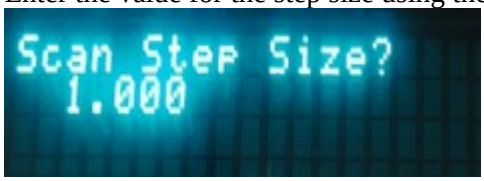
3. Press Enter
to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

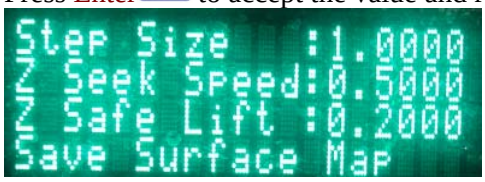
until Step Size is highlighted in bue.

5. Press Enter
to adjust the step size.

6. Enter the value for the step size using the number keypad (e.g., 1.000)



7. Press Enter
to accept the value and return to the SurfMap sub-menu.



SurfMap Menu

Z Seek Speed

The Z Seek Speed function is used to modify the seeking speed for the Z assembly.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

3. Press Enter to access the SurfMap sub-menu.

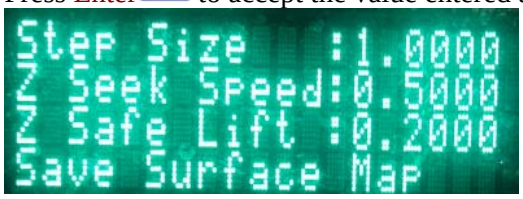
4. Press X-axis Jog Arrows

until Z Seek Speed is highlighted in blue.

5. Press Enter to access the Z assembly speed.

6. Enter the value for the Z assembly speed using the number keypad (e.g., 0.500).

7. Press Enter to accept the value entered and return to the SurfMap sub-menu.



SurfMap Menu

Z Safe Lift

The Z Safe Lift function is used to set the distance of the lift between each probe. The default value is 0.2” (5.08mm).

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

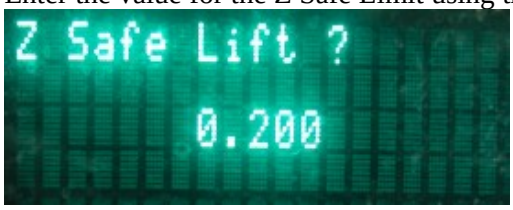
3. Press Enter to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Z Safe Lift is highlighted in blue.

5. Press Enter to access the Z Safe Limit.

6. Enter the value for the Z Safe Limit using the number keypad (e.g., 0.200).



7. Press Enter to accept the value entered and return to the SurfMap sub-menu.

SurfMap Menu

Save Surface Map

The Save Surface Map function is used to save up to 4 surface maps. The system maintains this information in the Material Library.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

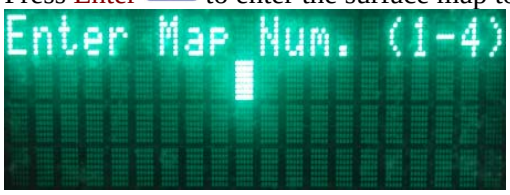
until SurfMap is highlighted in blue.

3. Press Enter to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

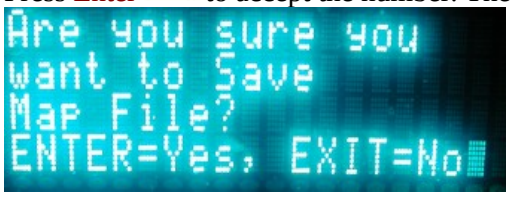
until Save Surface Map is highlighted in blue.

5. Press Enter to enter the surface map to be saved.



6. Enter the value for the map being saved using the number keypad.

7. Press Enter to accept the number. The system will prompt the operator about saving the Map File.



8. Press Enter to update or Cancel to exit without saving.

SurfMap Menu

Load Surface Map

The Load Surface Map function is used to load a saved surface map into the system.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

3. Press Enter to access the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Load Surface Map is highlighted in blue.

5. Press Enter to access the saved surface map.

6. Enter the value for the saved surface map using the number keys. If the operator types in a map number that does not exist, the system will indicate that the map number does not exist and will return to the SurMap sub-menu.

7. Press Enter to access the saved surface map.

SurfMap Menu

Surf. Map: Status

The Surface Map: Status function is used to validate the surface map. With the surface map enabled, the displayed Z value on the keypad will change according to the map. Operators can activate the map and Jog in the X- and Y-axes to verify the Z position. If no surface map has been loaded, then the status will remain inactive.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

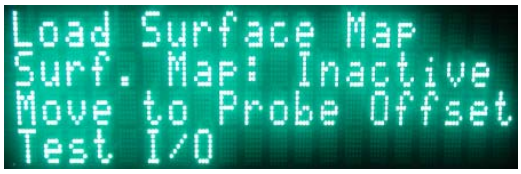
until SurfMap is highlighted in blue.

3. Press Enter to enter the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Surf. Map: Status is highlighted in blue.

5. Press Enter to toggle the surface map to active or inactive.



SurfMap Menu

Move to Probe Offsets

The Move to Probe Offsets function is used to verify that the X and Y probe offsets are set correctly. These values are also set in parameters 215 and 216.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until SurfMap is highlighted in blue.

3. Press Enter to enter the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Move To Probe Offsets is highlighted in blue.

5. Press Enter to access the probe offsets.

6. Press Enter to move the offsets.

7. Press Cancel to return to the SurfMap sub-menu.

SurfMap Menu

Test I/O

The Test I/O function is used to test the inputs and outputs of the Surface Map system.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

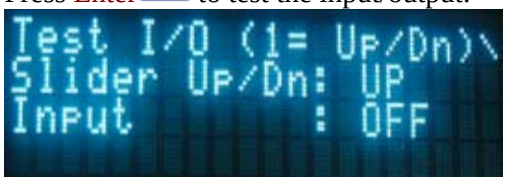
until SurfMap is highlighted in blue.

3. Press Enter to enter the SurfMap sub-menu.

4. Press X-axis Jog Arrows

until Test I/O is highlighted in blue.

5. Press Enter to test the input/output.



6. Press 1 to toggle the slider up and down. The display will indicate which direction is active.

7. Press Cancel to exit the Test I/O function and return to the SurfMap sub-menu.

SurfMap Menu

Shutdown

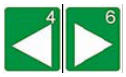
The Shutdown function is used to safely end the operating functions of the laser. Operators should proceed to power down the machine at the end of the day or if there will be no cutting sequences performed for an extended period of time.

1. Press Menu

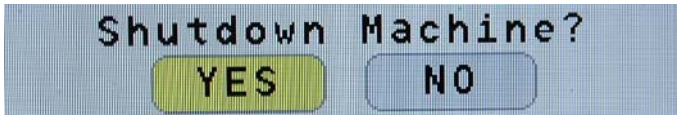
to access the menu system.

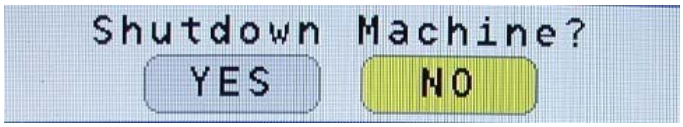
2. Press X-axis Jog Arrows

until Shutdown is highlighted in blue.

3. Press Enter to begin the Shutdown sequence. Operators may press Y-axis Jog Arrows 

to move between Yes and No.





4. Press Enter when Yes is highlighted to shut down the machine. The system will disable the motor drives and prompt the operator when it is safe to power down the laser.

Menu

Cut_Utils

The Cut Utilities sub-menu is used to cut material into common shapes, surface or resurface material that needs to be flat, test the output of the system, and cut off the remainder of the material that is presently being cut.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.

3. Press Enter
to access the Cut_Utils sub-menu.

4. Press X-axis Jog Arrows

until the appropriate option is highlighted in blue. Certain menu items will then enter a sub-menu with more selections.

Matl_Cut	Circle
Square	Rectangle
Rect_Rnd	Polygon
RipCut	Flange

Menu

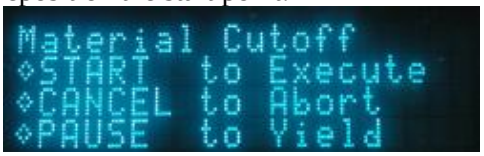
Material Cutoff

The Material Cutoff function is used to manually cut off the remainder of the material being cut in a single, straight-line or diagonal cutting move using the present Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate). It is not necessary to set home as the cut will begin at the current X,Y location of the head assembly.
2. Press Jog Arrows to position the head assembly in the desired start position.
3. Press Menu to access the menu system.
4. Press X-axis Jog Arrows until Cut_Utils is highlighted in blue.
5. Press Enter to access the Cut Utilities sub-menu.
6. Press X-axis Jog Arrows until Matl_Cut is highlighted in blue.
7. Press Enter to access the Material Cutoff function.
8. Enter the desired value for the X Cutoff Distance using the number keypad (e.g., 0) and press Enter .

9. Enter the desired value for the Y Cutoff Distance using the number keypad (e.g., 60) and press Enter .

10. Press X-axis Down Jog Arrow to access the Dry Run function if needed. This step is optional and can be skipped.
11. Press Start to execute Material Cutoff, Cancel to abort the function, or Pause to reposition the start point.



Cut_Utils Menu

Square

The Square function is used to run a Square Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate).
2. Press Menu

to access the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Square is highlighted in blue.
6. Press Enter to access the Square function.
7. Enter the length of the side for the Square using the number keypad (e.g., 9.000).

8. Press Enter to accept the value.
9. Press X-axis Down Jog Arrow

to access the Dry Run function if needed. This step is optional and can be skipped.
10. Press Start to execute Square Cut, Cancel to abort the function, or Pause to reposition the start point.

Cut_Utils Menu

Radiused Rectangle

The Radiused Rectangle function is used to run a Radiused Rectangle Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate).
2. Press Menu

to access the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Rect_Rnd is highlighted in blue.
6. Press Enter to access the Radiused Rectangle function.
7. Enter the length of the X and Y sides for the Rectangle using the number keypad (e.g., X=19, Y=20).

8. Press Enter to accept the X value.

9. Press Enter to accept the Y value.
10. Enter the radius of the corners using the number keypad (e.g., 1.5).

11. Press Enter to accept the value of the corners.

12. Press X-axis Down Jog Arrow to access the Dry Run function if needed. This step is optional and can be skipped.

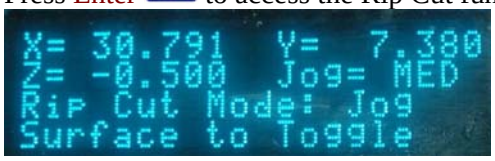
13. Press Start to execute Radiused Rectangle Cut, Cancel to abort the function, or Pause to reposition the start point.

Cut_Utils Menu

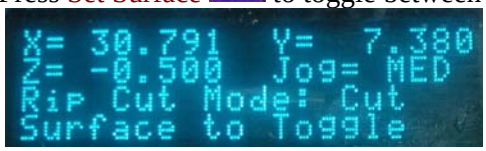
Rip Cut

The Rip Cut function is used to manually cut wherever the machine is Jogged so that the operator can remove excess material or even cut out simple shapes if desired.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Cut Height, Lift Height, and X & Y Feedrate). It is not necessary to set home as the cut will begin at the current X,Y location of the cutting head.
2. Press Jog Arrows to position the cutting head in the desired start position.
3. Press Menu to access the menu system.
4. Press X-axis Jog Arrows until Cut_Utils is highlighted in blue.
5. Press Enter to access the Cut Utilities sub-menu.
6. Press X-axis Jog Arrows until RipCut is highlighted in blue.
7. Press Enter to access the Rip Cut function.



8. Press Set Surface to toggle between Jog and Cut.



9. Press Jog Arrows to start moving the head assembly, which will plunge into the material after reaching the programmed RPM. The head assembly will cut for as long as the Jog arrow is depressed.
10. Press Set Surface again and as needed to toggle between Jog and Cut.
11. Press Cancel to exit the Rip Cut mode.

Cut_Utils Menu

Circle

The Circle function is used to run a Circle Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate).
2. Press Menu

to access the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Circle is highlighted in blue.
6. Press Enter to access the Circle function.
7. Enter the radius of the Circle using the number keypad (e.g., 0.500).

8. Press Enter to accept the value.
9. Press X-axis Down Jog Arrow

to access the Dry Run function if needed. This step is optional and can be skipped.
10. Press Start to execute Circle Cut, Cancel to abort the function, or Pause to reposition the start point.

Cut_Utils Menu

Rectangle

The Rectangle function is used to run a Rectangle Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate).
2. Press Menu

to acces the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Rectangle is highlighted in blue.
6. Press Enter to access the Rectangle function.
7. Enter the length of the X and Y sides for the Rectangle using the number keypad (e.g., X=19, Y=20).

8. Press Enter to accept the X value.

9. Press Enter to accept the Y value.
10. Press X-axis Down Jog Arrow

to access the Dry Run function if needed. This step is optional and can be skipped.
11. Press Start to execute Rectangle Cut, Cancel to abort the function, or Pause to reposition the start point.

Cut_Utils Menu

Polygon

The Polygon function is used to run a Polygon Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, Pierce Height, and X & Y Feedrate).
2. Press Menu

to access the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Polygon is highlighted in blue.
6. Press Enter to access the Polygon function.
7. Enter the number of sides ranging between 3 and 20 for the Polygon using the number keypad (e.g., 3).

8. Press Enter to accept the number of sides.
9. Enter the radius of the Polygon using the number keypad (e.g., 0.5).

10. Press Enter to accept the value.
11. Press X-axis Down Jog Arrow

to access the Dry Run function if needed. This step is optional and can be skipped.
12. Press Start to execute Polygon Cut, Cancel to abort the function, or Pause to reposition the start point.

Cut_Utils Menu

Flange

The Flange function is used to run a Flange Shape sample file to test the output of the system using the present Set Home, Cut Height, Lift Height, and X & Y Feedrate.

1. Set up the system as if a normal file is to be executed (e.g., Material Library, Set Home, Cut Height, Lift Height, and X & Y Feedrate).
2. Press Menu

to access the menu system.
3. Press X-axis Jog Arrows

until Cut_Utils is highlighted in blue.
4. Press Enter to access the Cut Utilities sub-menu.
5. Press X-axis Jog Arrows

until Flange is highlighted in blue.
6. Press Enter to access the Flange function.
7. Enter the number of bolts for the flange using the number keypad (e.g., 4) and press Enter .

8. Enter the bolt center diameter using the number keypad (e.g., 3.000) and press Enter .

9. Enter the bolt diameter using the number keypad (e.g., 0.500) and press Enter .

10. Enter the inner diameter using the number keypad (e.g., 2.000) and press Enter .

11. Enter the outer diameter using the number keypad (e.g., 4.000) and press Enter .

12. Press X-axis Down Jog Arrow to access the Dry Run function if needed. This step is optional and can be skipped.

13. Press Start to execute Flange Cut, Cancel to abort the function, or Pause to reposition the start point.

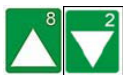
Cut_Utils Menu

Utility

The Utility sub-menu is used to provide the operator with additional options for completing, changing, or monitoring a cutting sequence. Some of these menu items contain a sub-menu for further specifications.

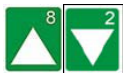
1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows 

until the appropriate option is highlighted in blue. Certain menu items will then enter a sub-menu with more selections.

Clr_Home
Reboot
FocusTest
DNC_Mode
Laser Cal
Laser Ptr

Job_Time
ParkPos
Test Cap.
Purge Gas

Menu

Clr_Home

The Clr_Home function is used to clear the soft home location 0 and reset to the hard home location of 0,0 until a new home is set from the menu system.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Utility is highlighted in blue.

3. Press Enter
to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Clr_Home is highlighted in blue.

5. Press Enter
to clear the home location. The display will return to the Utility sub-menu.

Utility Menu

Reboot

The Reboot function is used to reboot the machine without having to power down.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

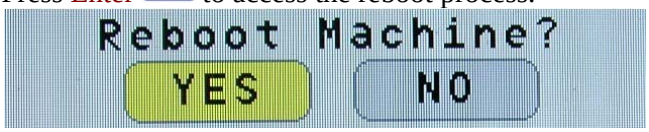
until Utility is highlighted in blue.

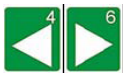
3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

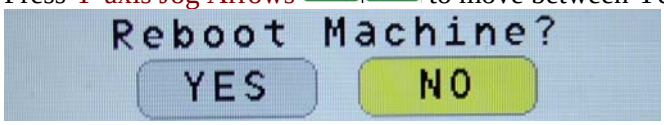
until Reboot is highlighted in blue.

5. Press Enter to access the reboot process.



6. Press Y-axis Jog Arrows 

to move between Yes and No.



7. Press Enter to process the reboot of the machine. If No is selected, then the display will return to the Utility sub-menu.

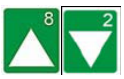
Utility Menu

Focus Test

The Focus Test function is used to verify the laser focus accuracy. The test will start at the current X,Y,Z location, so operators should Jog the head assembly to the desired position before starting the test.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until FocusTest is highlighted in blue.

5. Press Enter to begin the Focus Test routine.

6. Enter the first Z Step Distance using the number keypad (e.g., 0.050) and press Enter .

7. Enter the second Z Step Distance using the number keypad (e.g., 0.010) and press Enter .

8. Press Start to begin the Focus Test. If multiple bright sparks appear, operators should lower Power.

   a. The laser will fire 10 times decrementing the lens height between shots per the “1st Z Step Dist.” value, and the operator will then choose the brightest spark of the group and enter the number at the prompt.

   b. The laser will then repeat the same test using the “2nd Z Step Dist.” value, and the operator will choose the brightest spark of that group and enter the number at the prompt.

9. Press Enter to start the surfacing routine.

   a. Press Jog Arrows to position the **center of the head assembly** over the material to be cut.

   b. Press Set Surface .

   c. Enter the material thickness.

   d. Press Z-axis Jog Arrows

      i. Ferrous metals or machines with capacitive height sensors
      to lower the Z-axis until the head assembly is approximately 1/4” above the material.

      ii. Non-ferrous metals or machines without capacitive height sensors
      to position the surface sensor over the material to be cut.

   e. Press Zero to begin the surfacing routine.

      i. Ferrous metals or machines with capacitive height sensors
      This will cause the Z-axis to move down slowly until the tool comes in contact with the surface block and then move up above the surface block to the Lift Height.

      ii. Non-ferrous metals or machines without capacitive height sensors
      This will cause the Z-axis to move down slowly until the surface sensor comes in contact with the surface block and then move up above the surface block to the Lift Height.

Pressing Cancel at any time will **automatically set the surface** without referencing the location to the sensor. If the operator chooses to automatically set the surface, he or she will have to go through the entire sequence each time the material changes.

Utility Menu

DNC Mode

The DNC Mode function is used to allow the operator to toggle back and forth between local and remote DNC Modes. Local mode allows the operator to review what files have been saved in the controller, and remote mode allows the operator to run programs. The system must be set to remote mode to run the file.

The DNC Mode can create a shortcut for commonly used files without the operator having to enter the Utility sub-menu each time. The controller memory allows a maximum of 20 job files or a limited amount of memory space for large job files to be saved to the controller. The display will indicate when the memory capacity is full with a notice showing *Error Writing File; Out of Room*. The operator will need to delete a job file from the controller memory before adding any new job files.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

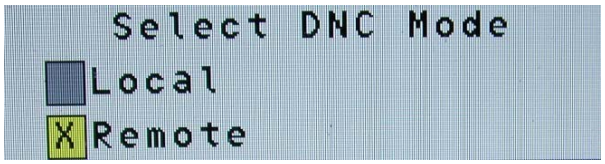
until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until DNC Mode is highlighted in blue.

5. Press Enter to access the DNC mode. An X will be located to the left of the mode currently being run.



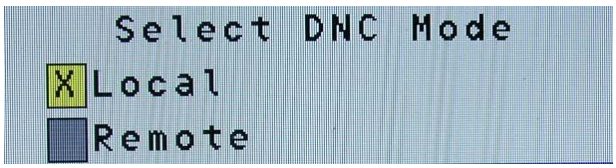
6. Press X-axis Jog Arrows

to move between the DNC Modes. Local mode shows what files have been saved to the controller while the remote mode shows what files are available in the PC.

7. Press Enter to accept the selected mode and return to the main display.

Saving Files to Controller DNC

1. Make sure the DNC mode is set for local.

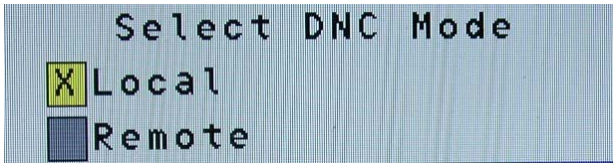


2. Press Shift and DNC to access the list of files available in the PC.

3. Press X-axis Jog Arrows until the particular job file to be saved to the controller is highlighted in blue.
4. Press Enter to accept the job file.
5. Press Start to save the file to the controller. The operator can access the file from the DNC function at the keypad.
6. Press Cancel to return to the Utility sub-menu.
7. Press DNC to access the files available from the controller.
8. Press X-axis Jog Arrows until the particular job file to be run is highlighted in blue.
9. Press Enter to access the job file and then Start to execute the job file.

Deleting Files from Controller DNC

1. Make sure the DNC mode is set for local.



2. Press DNC to access the list of job files available in the controller.
3. Press X-axis Jog Arrows until the particular job file to be deleted from the controller is highlighted in blue.
4. Press Enter to access the job file.
5. Press Material Library to set the system to delete the job file.
6. Press Enter to delete the job file.

Utility Menu

Laser Cal

The Laser Calibration function allows the operator to gauge the wattage being used during the cutting sequence. A power meter is needed to complete this function, and operators are encouraged to periodically run the Laser Cal process to maintain the system.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

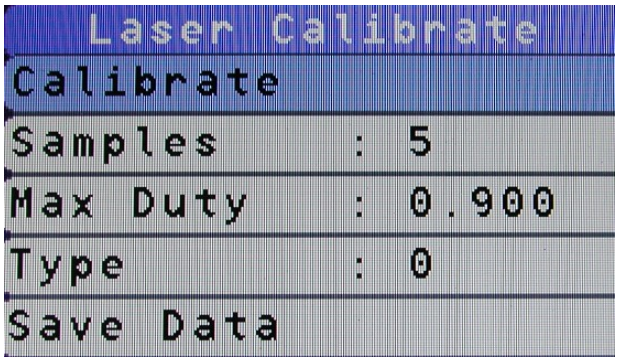
until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Laser Cal is highlighted in blue.

5. Press Enter to access the Laser Cal sub-menu.



6. Press X-axis Jog Arrows

until the appropriate option is highlighted. The recommended number of samples is 10 with a frequency of 12KHz for a more accurate setting.

7. Press Enter to begin the calibration process. The value is then stored in the controller until changed by the operator.

8. Press Cancel to return to the Utility sub-menu.

Utility Menu

Laser Ptr

The Laser Pointer function is used to indicate the current direction of the beam path prior to cutting. This can be useful when leveling the beam since the laser pointer shows exactly where 0,0 is.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Utility is highlighted in blue.

3. Press Enter
to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Laser Ptr is highlighted in blue.

5. Press Enter
to toggle the laser pointer on and off.

6. Press Cancel
twice to return to the main display. The main display screen will show if the laser pointer is active.

Utility Menu

Job_Time

The Job_Time function is used to display the amount of time the previous job required.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Job_Time is highlighted in blue.

5. Press Enter to view the exact job time.

6. Press Cancel to return to the Utility sub-menu.

Utility Menu

ParkPos

The ParkPos function is used to set a specific Park location for the X- and Y-axes to assume after each job, which is useful when currently using only a portion of the available table space. The X- and Y-axes can be set to move just far enough out of the way for the material to be removed instead of parking all the way to the rear every time.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until ParkPos is highlighted in blue.

5. Press Enter to access the ParkPos function.

6. Enter the desired park position for the head assembly in X using the number keypad (e.g., 100.000) or enter 0 to use the table size.

7. Press Enter to accept the value and return to the Utility sub-menu.

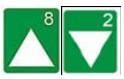
Utility Menu

Test Cap

The Cap Sensor function is used to access several settings specific to the capacitive cutting head and sensor. This menu item is not applicable to systems with no capacitive cutting head and sensor.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Cap Sensor is highlighted in blue.

5. Press Enter to access the Capacitive Sensor sub-menu.

7. Scroll to a specific option and press Enter .

- Select Mem: 1 – toggles between 1 and 2
  This setting is specific to Haas Capacitive Height controllers and allows the operator to save the electrical calibrations associated with the 2.5” (63.5mm) lens and the 5” (127mm) lens.
- Cal. Cap Sensor – calibrates the capacitive height system to the surface
- Test Cap. Sensor – checks the outputs between the capacitive sensor and the controller

8. Press Cancel to return to the Utility sub-menu.

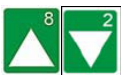
Utility Menu

Purge Gas

The Purge Gas function is used to release any excess gas that may have built up while using the capacitive cutting head and sensor.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Utility is highlighted in blue.

3. Press Enter to access the Utility sub-menu.

4. Press X-axis Jog Arrows

until Purge Gas is highlighted in blue.

5. Press Enter to purge the system of any built-up gas. The menu will not change, and operators may either continue working in the Utility sub-menu or exit out of the menu and work elsewhere.

Utility Menu

Kerf Compensation

The Kerf Compensation function is used to adjust the kerf compensation value, which is the distance the laser must be moved to either the inside for internal cuts or holes or the outside for external cuts to produce the desired cut size. ***MultiCam*** uses left kerf almost exclusively so that CCW in the codes indicates internal cuts and CW indicates external cuts.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Kerf Comp is highlighted in blue.

3. Press Enter to adjust the kerf compensation.

4. Enter the kerf value up to a maximum of 0.10 using the number keypad (e.g., 0.010).

5. Press Enter to accept the value. The display will return to the main menu.

Menu

Vision

MultiVision offers operators the option in completing various projects to use cameras for setting up fiducials, or reference marks for Vision Tool software, to streamline repetitive cutting projects of similar material or design. The Vision menu offers several different options for operators to utilize their system for an improved output. MultiVision offers a few settings that must be set once and then are stored in the controller memory until those settings are overwritten.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until the appropriate option is highlighted in blue. Certain menu items will then enter a sub-menu with more selections.

Fiducial Diameter
Job Scaling
Correlation
Retake Distance
Settling Time
Auto Find Setting
Manual Find Setting
Set Camera Scale
Set Camera Offsets
Move to Camera Offsets
Fiducial Check
Connection Test

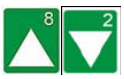
Menu

Fiducial Diameter

The Fiducial Diameter function is used to inform the system as to the size of the fiducial when the system is searching. This diameter can be set up in either inches or millimeters.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Fiducial Diameter is highlighted in blue.

5. Press Enter to adjust the Fiducial Diameter.

or

6. Enter the value using the number keypad (e.g., 0.250).

7. Press Enter to save the Fiducial Diameter and return to the Vision sub-menu.

Vision Menu

Job Scaling

The Job Scaling function allows the operator to set the system to use 1:1 scaling in fixed mode or to configure the scaling based on the distances between the first and second fiducial and between the first and third fiducial in automatic mode. Fixed mode is used mainly for testing, while most operators will use automatic mode.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Job Scaling is highlighted in blue.

5. Press Enter to toggle between Auto and Fixed.

Vision Menu

Correlation

The Correlation Value function is used to establish the pass/fail values for settings that are typically in the range of 0.2 to 1.0. This function can be utilized if the material to be cut has a fuzzy or indistinct fiducial and the camera is unable to capture a clear image. If the correlation value is too low or too high, it will be rejected.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Correlation is highlighted in blue.

5. Press Enter to access the Correlation function.

6. Enter the correlation value using the number keypad (e.g., 0.200).

7. Press Enter to save the value and return to the Vision sub-menu.

Vision Menu

Retake Distance

The Retake Distance function allows the operator to improve the accuracy of the picture. The system will calculate how far away the fiducial is when a picture is taken. If that distance is greater than the retake distance, the camera will center the fiducial and take another picture. Operators should select a small distance (e.g., 0.002) to get the best results under the Fiducial Check function.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Retake Distance is highlighted in blue.

5. Press Enter to access the Retake Distance function.

6. Enter the distance for the camera to adjust so that the fiducial can be pictured clearly (e.g., 5.08mm or 0.20”).

7. Press Enter to save the distance and return to the Vision menu.

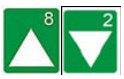
Vision Menu

Settling Time

The Settling Time function is used to specify how long the system must wait before reading the fiducial. This is helpful in case the camera is shaking after slewing into position. Most systems work best with 1000 msec.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Settling Time is highlighted in blue.

5. Press Enter to adjust the Settling Time.

6. Enter the value using the number keypad (e.g., 1000 ms).

7. Press Enter to save the delay time and return to the Vision sub-menu.

Vision Menu

Auto Find Setting

The Auto Find Setting function is used to specify the distance that the system will scan for the fiducial before prompting the operator to Jog to the proper location if the fiducial is out of range. Auto Find Setting will prompt the operator to Jog to the area where the first fiducial should be without trying to auto find it and will only search for the second and later fiducials by looking in the area of where they should be.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

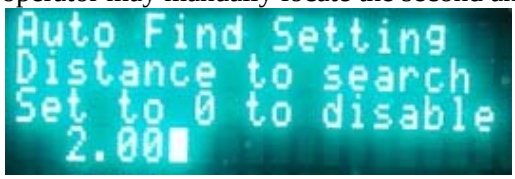
3. Press Enter
to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Auto Find Setting is highlighted in blue.

5. Press Enter
to access the Auto Find Setting function.

6. Enter the distance for the camera to scan for the fiducial (e.g., 0.2” or 50.8 mm) or leave as “0” so the operator may manually locate the second and third fiducials.



or

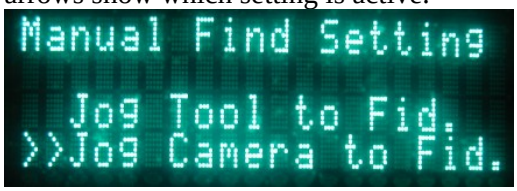
7. Press Enter
to save the distance and return to the Vision menu.

Vision Menu

Manual Find Setting

The Manual Find Setting function can be utilized once the Auto Find Setting has been disabled. Operators can enter “0” under Auto Find Setting before selecting Manual Find Setting and then select to either Jog the tool to the fiducial or Jog the camera to the fiducial. Operators can press Enter once the laser or camera, whichever has been selected in the keypad, is directly above the fiducial.

1. Press Menu to access the menu system.
2. Press X-axis Jog Arrows until Vision is highlighted in blue.
3. Press Enter to access the Vision sub-menu.
4. Press X-axis Jog Arrows until Manual Find Setting is highlighted in blue.
5. Press Enter to access the Manual Find Setting function.
6. Press X-axis Jog Arrows to move between “Jog Tool to Fid.” and “Jog Camera to Fid.” The double arrows show which setting is active.

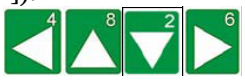


7. Press Enter to return to the Vision sub-menu.

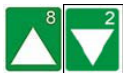
Vision Menu

Set Camera Scale

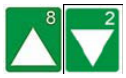
The Set Camera Scale function is used to calibrate the camera scale. The operator specifies a distance to which the machine will move, take a picture, move back, take a picture, calculate the scale, and save the camera scale. The camera scale can be set at the initial setup and then will default to 1000. Operators should repeat the Set the Camera Scale process **only if the diameter of the fiducial changes between job files** (e.g., 0.25 to 0.375 [6.35mm to 9.53mm]).

1 Press Jog Arrows  to reach a fiducial.

2. Press Menu to access the menu system.

3. Press X-axis Jog Arrows  until Vision is highlighted in blue.

4. Press Enter to access the Vision sub-menu.

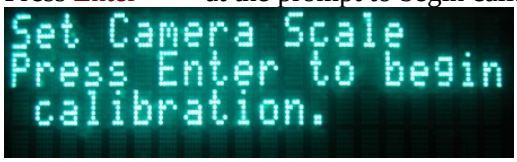
5. Press X-axis Jog Arrows  until Set Camera Scale is highlighted in blue.

6. Press Enter to access the Set Camera Scale function. The keypad display will prompt the operator for a move size. The operator specifies a distance to which the machine will move, take a picture, move back, take a picture, calculate the scale, and save the camera scale.

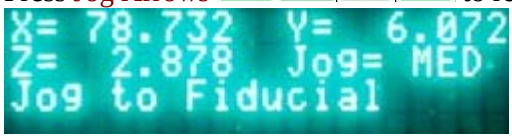
7. Enter 0.2 for 1” FOV lens (5.08 for 6.35 mm) for a standard Ethernet camera and press Enter . The camera will complete a series of 0.2” (5.08 mm) moves off the fiducial point as the camera checks for pixels per inch (mm). The scale will be based on these readings. A typical scale value will be 1000 ± 100 for a 1” (25.4mm) FOV.

or

8. Press Enter at the prompt to begin calibration.



9. Press Jog Arrows to reach the fiducial on the material to be cut and press Enter .



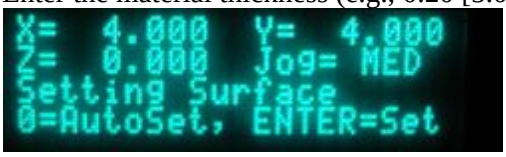
Vision Menu

Set Camera Offsets

The Set Camera Offsets function is used to set the camera offsets based on the center of the cutting head and the center of the camera by burning a hole based on the values entered in the Params_2D menu. The system prompts the operator to Jog over until the fiducial is close to the center of the computer screen. The location does not have to be exact. Camera offsets are usually set at installation and do not need to be reset unless the cutting head is replaced.

1. Place a piece of white paper over a black material, such as a dark laminate, to set the camera offset.

2. Set the surface on the white paper.
   a. Press Jog Arrows to position the **center of the head assembly** over the white paper.
   b. Press Set Surface .
   c. Enter the material thickness (e.g., 0.20 [5.08mm]). The display will prompt the operator to set the surface.



   d. Press Z-axis Jog Arrows
      - Ferrous metals or machines with capacitive height sensors
        to lower the Z-axis until the head assembly is approximately 0.25” (6.35mm) above the material.

      - Non-ferrous metals or machines without capacitive height sensors
        to position the surface sensor over the material to be cut.

   e. Press Zero to begin the surfacing routine.
      - Ferrous metals or machines with capacitive height sensors
        This will cause the Z-axis to move down slowly until the head comes in contact with the surface and then move up above the surface to the Lift Height.

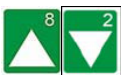
      - Non-ferrous metals or machines without capacitive height sensors
        This will cause the Z-axis to move down slowly until the surface sensor comes in contact with the surface and then move up above the surface to the Lift Height.

3. Set the Pen 1 parameters from the Params_2D menu to burn through the white paper without burning the spoilboard. The **suggested settings** are shown below; actual settings may vary between machines.

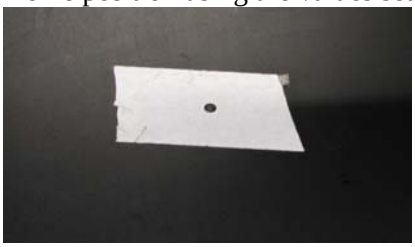
Parameter	Value
X,Y Feedrate	60
Power	30
Cut Height	0.1
Pierce Pressure	20
Cut Pressure	20
Pierce Power	10
Pierce Time	0

4. Set Home at the center of the white paper.
   a. Press Jog Arrows to place the **center of the head assembly** over the white paper.
   b. Press Set Home .

   c. Press Enter to accept. This will store the absolute X and Y coordinate locations in the controller's memory.

5. Set the Camera Offset.
   a. Press Menu to access the menu system.
   b. Press X-axis Jog Arrows until Vision is highlighted in blue.
   c. Press Enter to access the Vision sub-menu.
   d. Press X-axis Jog Arrows  until Set Camera Offsets is highlighted in blue.

e. Press Enter to mark a fiducial at the current home. The laser will turn on and burn a circle at the Home position using the values set in Params_2D.



6. Remove the dark laminate before running the job file.

Vision Menu

Move to Cam Offsets

The Move to Camera Offsets function is mainly used as a verification tool to center the camera over the fiducial.

1. Press Menu to access the menu system.
2. Press X-axis Jog Arrows until Vision is highlighted in blue.
3. Press Enter to access the Vision sub-menu.
4. Press X-axis Jog Arrows until Move to Cam Offsets is highlighted in blue.
5. Press Enter to move the system to the camera offsets.

6. Click on Live Feed in the toolbar.
7. Press Jog Arrows to move the camera over a fiducial.
8. Press Z-axis Jog Arrows to bring the fiducial into clearer view.
9. Press Enter once the fiducial is clear and return to the Vision menu.

Vision Menu

Fiducial Check

The Fiducial Check function allows the operator to determine how far out of square the machine is. Once the fiducials are found, the system calculates the X,Y Offset and Rotation values. Based on these values, the system can relocate the fiducials and display them in MotionMechanic, showing how far off the fiducials are in the X- and Y-axes. Once the fiducials are relocated, the display will prompt the operator about aborting the job. Fiducial Check works in conjunction with Retake Distance.

1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows

until Fiducial Check is highlighted in blue.

5. Press Enter to access the Fiducial Check function.

6. Press X-axis Jog Arrows

until the double arrows are to the left of the appropriate action.
   a. **Enable Check** allows the system to determine how much the table configuration has changed.
   b. **Disable Check** allows the system to continue operations without determining any change.

7. Press Enter to engage the selected action and return to the Vision sub-menu.

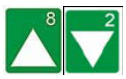
Vision Menu

Connection Test

The Connection Test function is used to test the communication between the controller and the computer via the VisionTool4 or MultiVision and JobServer applications. The screen is for information only, and operators can report any errors to Technical Support.

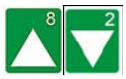
1. Press Menu

to access the menu system.

2. Press X-axis Jog Arrows 

until Vision is highlighted in blue.

3. Press Enter to access the Vision sub-menu.

4. Press X-axis Jog Arrows 

until Connection Test is highlighted in blue.

5. Press Enter to begin the Connection Test.

6. Press Cancel to exit the Communication test and return to the Vision sub-menu.

Vision Menu

Options

top

Fume Extraction 2
Capacitive Cutting Head 3

Fume Extraction

A Fume Extraction system is recommended for all lasers so as to properly handle the fumes and particulates that result from cutting any material. ***MultiCam*** Lasers can be purchased with or without a fume extraction system and are compatible for use with other manufacturers' fume extraction systems. The laser can be purchased independently of the fume extraction system, though the frequency of maintenance is similar for both machines and should be followed to extend the life of both the laser and fume extraction system.

The type of material being cut by the laser determines the type of fume extraction system most appropriate for the laser. All operators should **consult the MSDS sheet** prior to installing any fume extraction system as different materials will produce specific fumes and particulates that would be better handled by certain types of fume extraction systems. Operators may refer to any ***MultiCam*** Technician for recommendations on a ***MultiCam*** Fume Extraction system for their laser.

The fume extraction system must be turned on and off independently of the laser, and no adjustments need to be made to the system once it is on. Operators should refer to the OSHA guidelines for their state in regards to the proper setup of the fume extraction system, recognizing that OSHA can order an investigation if they learn of any disregard for those guidelines.

The ***MultiCam*** Fume Extraction system includes a ribbed hose for connection, and operators are encouraged to purchase a hard plumbing hose to extend the efficiency of the fume extraction system. All connectors can be purchased at a regular hardware store, and operators should refer to the User Manual provided with the fume extraction system for the proper dimensions of those connecting hoses.

Options

Capacitive Cutting Head

The Capacitive Cutting Head system uses the capacitance measured between the cutting nozzle and the grounded material to maintain the proper standoff for cutting. This distance must be maintained so that the focal point of the laser beam is always at the material surface. Finding the focal point and properly calibrating the Capacitive Cutting Head must be completed in order to cut slag-free parts.

The components of the Capacitive Cutting Head system are the Height Sensing Unit (HSU), the large coax cable connecting the HSU and the transformer, the transformer, the small coax cable or interface wire between the transformer and the cutting head, the capacitive head or tip retainer, and the gas tip (shown below). The calibration of the HSU is completed once the nozzle standoff has been set.

The Height Sense Unit (HSU) is calibrated at installation, but operators should calibrate the HSU weekly or if one of the following actions takes place:

* Gas Jet Tip, Tip Retainer, or Tip Retainer Nut is removed or replaced.
* Lower or small coaxial cable is removed or replaced.
* Large coaxial cable is removed or replaced.
* Tip Adjusting Nut is readjusted.
* The operator becomes unsure about the accuracy of the settings.

Options

Innovation. Quality. Performance. Best in Industry. Worldwide.

Connections

top

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Communication

The ***MultiCam*** Controller will support both Ethernet and Serial communications; however, ***MultiCam*** recommends using Ethernet communications whenever possible. Connect

Ethernet Connection Information

TCP/IP Ethernet connection is the preferred form of communications to all ***MultiCam*** controllers. The following information discusses several key components of Ethernet connections and how those components relate to connecting personal computers (PCs) and ***MultiCam*** CNC machines.

Requirements

Any company choosing to utilize ***MultiCam*** Ethernet communications as recommended must meet the following system requirements:

- Network card installed in the computer
- TCP/IP software installed in the computer
- Ethernet 10/100 MHz multiple port switch (cannot be wireless or a router)
- Ethernet patch cabling
- ***MultiCam*** Controller IP/Subnet in the same class network (IP/Subnet) as the Host PC

Wireless communication is not recommended for any ***MultiCam*** Ethernet system.

Ethernet Process

Every computer on a network has an IP address. The IP address tells other computers that the Host PC is ready to communicate with another device on the network. Each computer IP address must be unique within that network (e.g., 192.168.0.176 is the IP address for only one computer on the network).

In addition to IP addresses, each computer on a network is also assigned a subnet address. The subnet address is simply a way of separating larger networks into smaller, more manageable ones (e.g., 255.255.255.0 is one subnet address for ***MultiCam*** operating systems). Additionally, ***MultiCam*** CNC machines by design can only be used on a class “C” Network.

Setup

When any technician visits a customer site, he or she must first determine what type of network is available for the connection. The 2 types of networks are described below.

- Dynamic Host Configuration Protocol (DHCP) Network – Automatic Configuration

  The DHCP server will automatically provide networked computers with the required TCP/IP configuration from a central location. When a computer requires the use of TCP/IP network resources, it broadcasts a request for address information. The DHCP server responds to this request by assigning a new address and sending it to the computer along with other required configuration information for the network. This information is acknowledged by the computer and used in setting up that configuration.

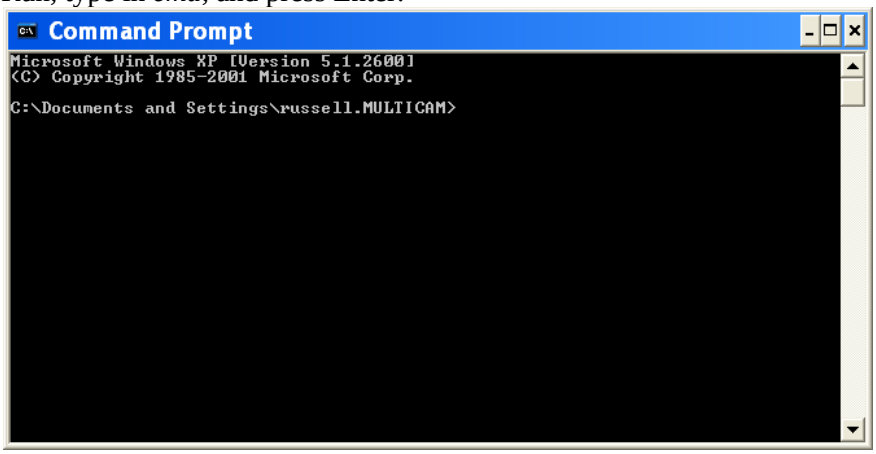
- Static Network – Manual Configuration

  The static network has a manually configured setup for each computer or device, and each device must be assigned the same subnet mask but a different IP address from all other computers and devices.

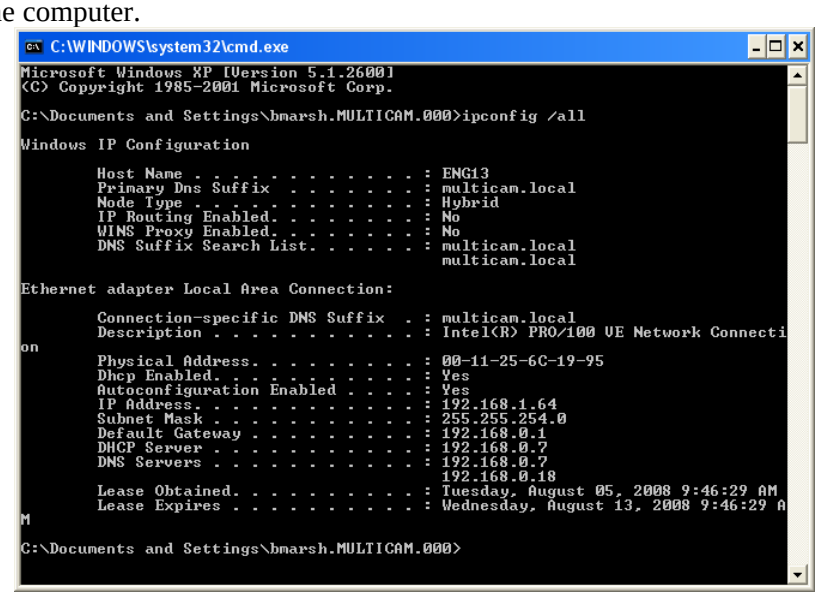
By default, most laptops and computers are shipped with DHCP already enabled. This does NOT mean that the network has a DHCP server that will automatically assign the computer an individual IP address. Technicians should still complete the following to determine the proper configuration for the machine:

1. Use the command prompt in Windows to check the IP configuration. Technicians can use either of the following methods:
   a. Go to Start >> All Programs >> Accessories >> Command Prompt.

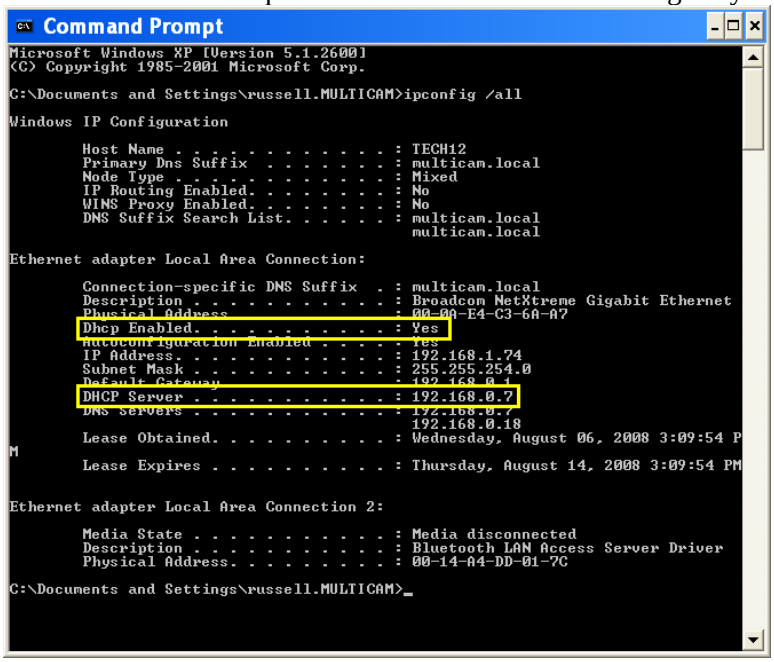
   b. Go to Start >> Run, type in *cmd*, and press Enter.



2. Type in *ipconfig /all* with a space between the *g* and the forward slash. This will pull up the Windows IP configuration for the computer.


C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\bmarsh.MULTICAM.000>ipconfig /all
Windows IP Configuration
Host Name . . . . . : ENG13
Primary Dns Suffix . . . . . : multicam.local
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : multicam.local
multicam.local
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : multicam.local
Description . . . . . : Intel(R) PRO/100 VE Network Connecti
on
Physical Address. . . . . : 00-11-25-6C-19-95
Dhcp Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IP Address. . . . . : 192.168.1.64
Subnet Mask . . . . . : 255.255.254.0
Default Gateway . . . . . : 192.168.0.1
DHCP Server . . . . . : 192.168.0.7
DNS Servers . . . . . : 192.168.0.7
192.168.0.18
Lease Obtained. . . . . : Tuesday, August 05, 2008 9:46:29 AM
Lease Expires . . . . . : Wednesday, August 13, 2008 9:46:29 A
M
C:\Documents and Settings\bmarsh.MULTICAM.000>

3. Look for the IP address and subnet mask in the *ipconfig /all* screen (i.e., DHCP Enabled status and the DHCP Server address). This information will be required if the technician has to change any of the addresses.


Command Prompt
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\russell.MULTICAM>ipconfig /all
Windows IP Configuration
Host Name . . . . . : TECH12
Primary Dns Suffix . . . . . : multicam.local
Node Type . . . . . : Mixed
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : multicam.local
multicam.local
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : multicam.local
Description . . . . . : Broadcom NetXtreme Gigabit Ethernet
Physical Address. . . . . : 00-0A-E4-C3-6A-A7
Dhcp Enabled. . . . . : Yes
IP Address. . . . . : 192.168.1.74
Subnet Mask . . . . . : 255.255.254.0
DHCP Server . . . . . : 192.168.0.7
192.168.0.18
Lease Obtained. . . . . : Wednesday, August 06, 2008 3:09:54 P
M
Lease Expires . . . . . : Thursday, August 14, 2008 3:09:54 PM
Ethernet adapter Local Area Connection 2:
Media State . . . . . : Media disconnected
Description . . . . . : Bluetooth LAN Access Server Driver
Physical Address. . . . . : 00-14-A4-DD-01-7C
C:\Documents and Settings\russell.MULTICAM>

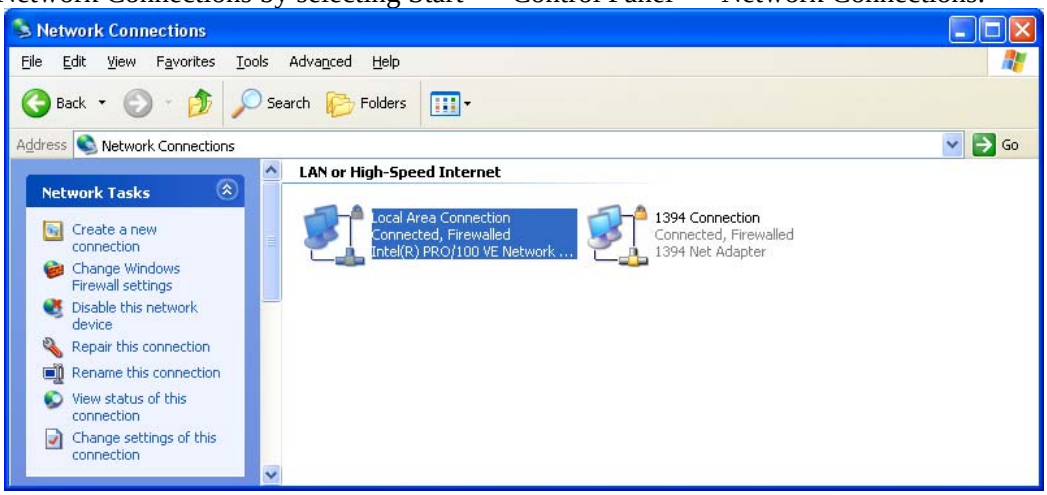
- If the network has an active DHCP, then DHCP Enabled will show *Yes*. The technician must also have an assigned IP address for the DHCP server (shown above).
- If the network does not have an active DHCP, then DHCP Enabled will show *No*, which indicates a static network.
- If any of the above information is not provided, then the technician is working with a static network.

Static Network Changes

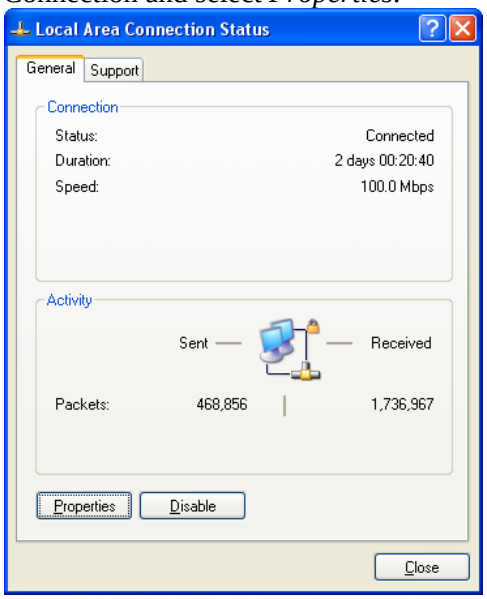
Technicians working with a static network may have to change the static IP and/or subnet address of the computer, the controller, or both. The following directions describe how technicians can change the IP and subnet addresses:

Computer Static IP/Subnet Address

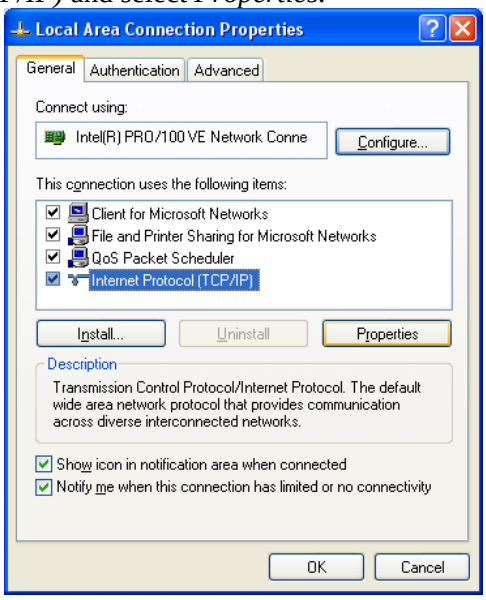
1. Access Network Connections by selecting Start >> Control Panel >> Network Connections.



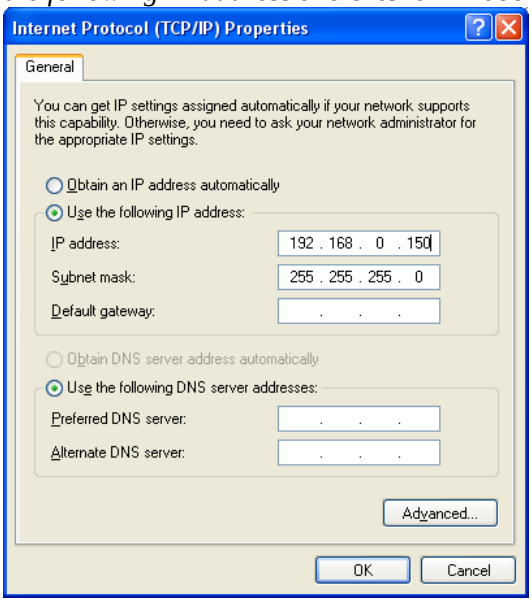
2. Double-click on the Local Area Connection and select *Properties*.



3. Highlight *Internet Protocol (TCP/IP)* and select *Properties*.



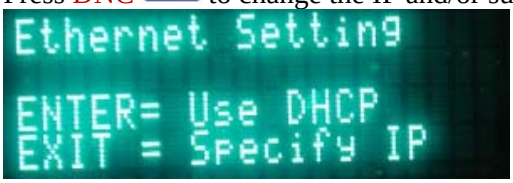
4. Click in the circle next to *Use the following IP address* and enter an IP address and the subnet mask.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 0 . 150
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Controller Static IP/Subnet Address

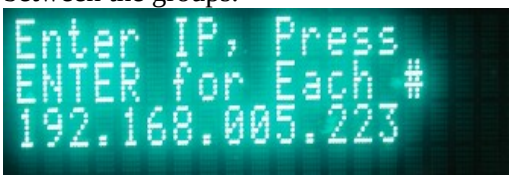
1. Press Shift, Help, and Two to access the Ethernet Information screen on the keypad.

2. Press DNC to change the IP and/or subnet mask address.



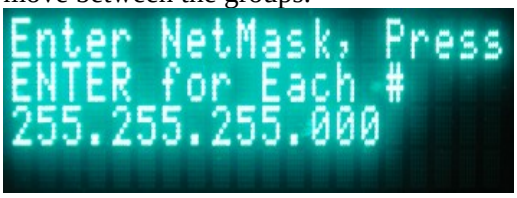
3. Press Exit to specify the IP address.

4. Type in the IP address as 4 groups of 3 numbers (e.g., 192.168.005.223) and press Enter to move between the groups.



5. Press Enter and wait for the screen to prompt for the netmask.

6. Type in the netmask address as 4 groups of 3 numbers (e.g., 255.255.255.000) and press Enter to move between the groups.



7. Press Enter to save the changes.

8. Reboot the machine for the IP and/or subnet mask address changes to take effect.

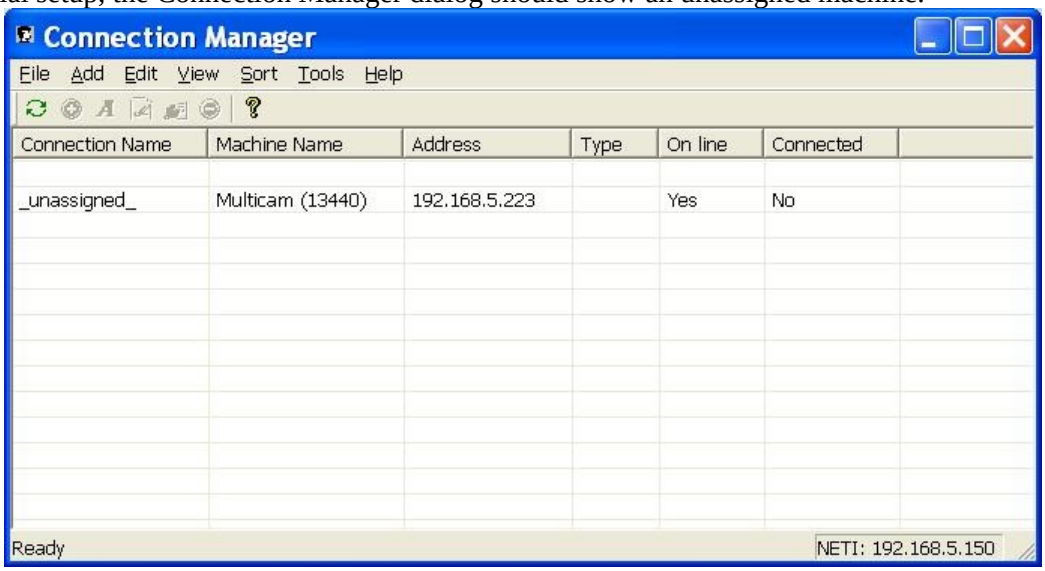
Connect

Setup for Ethernet Connection

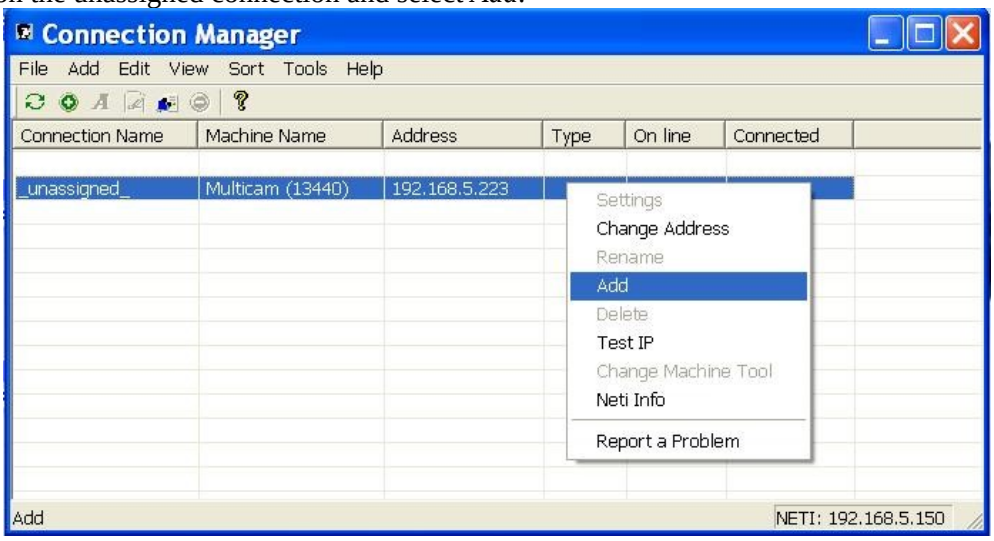
The Ethernet communication is set up through the Machine Tool Properties applet. Operators should make sure that the CNC machine is on and connected to the computer via an Ethernet connection before attempting to automatically install the Ethernet connection. The following directions assume that the operator has complied with all hardware requirements for Ethernet connections (see Ethernet Connection Information).

1. Right-click on the Machine Connections icon in the toolbar and select Connection Manager.

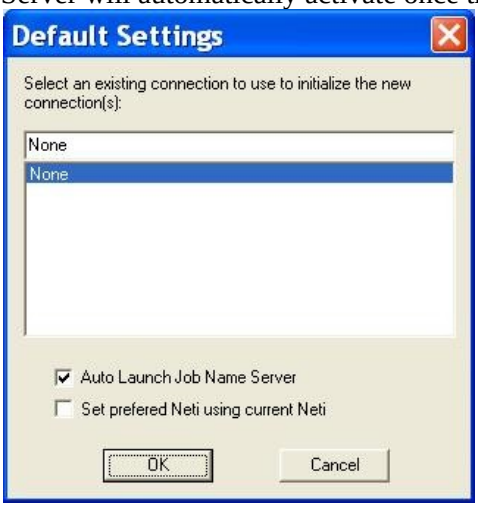
At the initial setup, the Connection Manager dialog should show an unassigned machine.



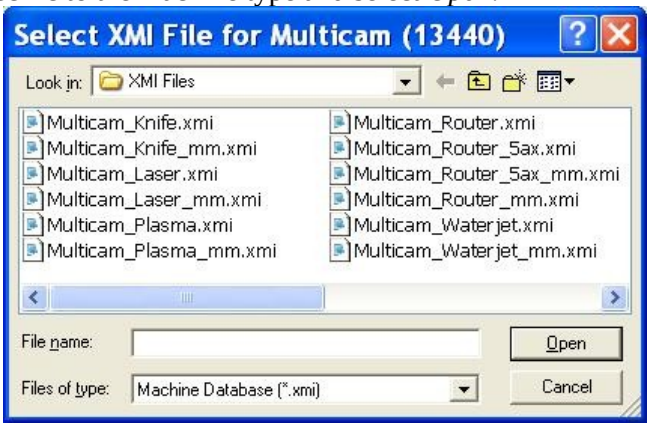
2. Right-click on the unassigned connection and select *Add*.



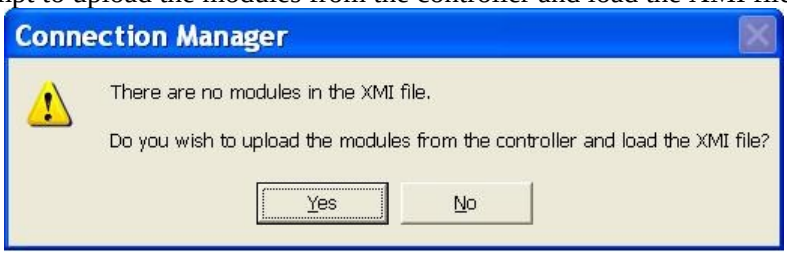
3. Select *None* at the Default Settings dialog. All customers are encouraged to check the box next to *Auto Launch Job Name Server* so that JobNameServer will automatically activate once the machine is connected.



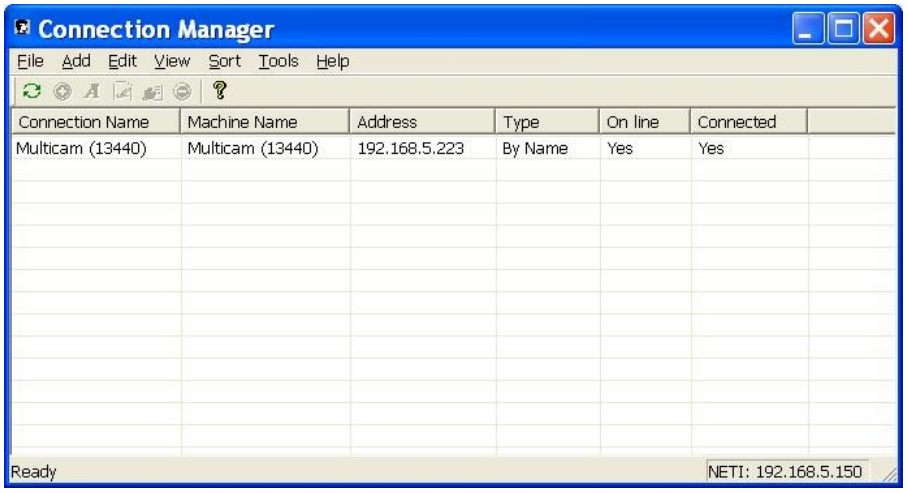
4. Highlight the XMI files specific to the machine type and select *Open*.



5. Select *Yes* at the prompt to upload the modules from the controller and load the XMI file.


Connection Manager
There are no modules in the XMI file.
Do you wish to upload the modules from the controller and load the XMI file?
Yes
No

This will assign a connection name to the machine.



Connect

Ethernet Cables

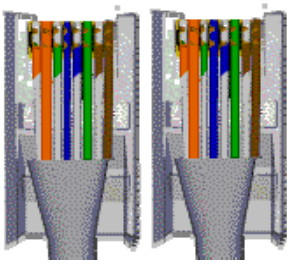
If the company has an established network, then the computers are probably already connected through a hub or switch. A patch cable is a standard cable used to connect a network device consisting of a computer, a network printer, and a ***MultiCam*** Controller to a hub or switch. However, the patch cable is unable to provide a direct connection with the ***MultiCam*** Controller, so the host PC must be connected through a switch or hub.

RJ45 Patch Cable

A patch cable is also known as a straight-through cable. The wires are in the same order on connector 1 as they are on connector 2. The RJ45 connectors are used on each end of the cable, and operators must verify that the connectors are being held the same way when checking.

Connect

Connector 1		Connector 2
Pin 1	>>>	Pin 1
Pin 2	>>>	Pin 2
Pin 3	>>>	Pin 3
etc...	>>>	etc...

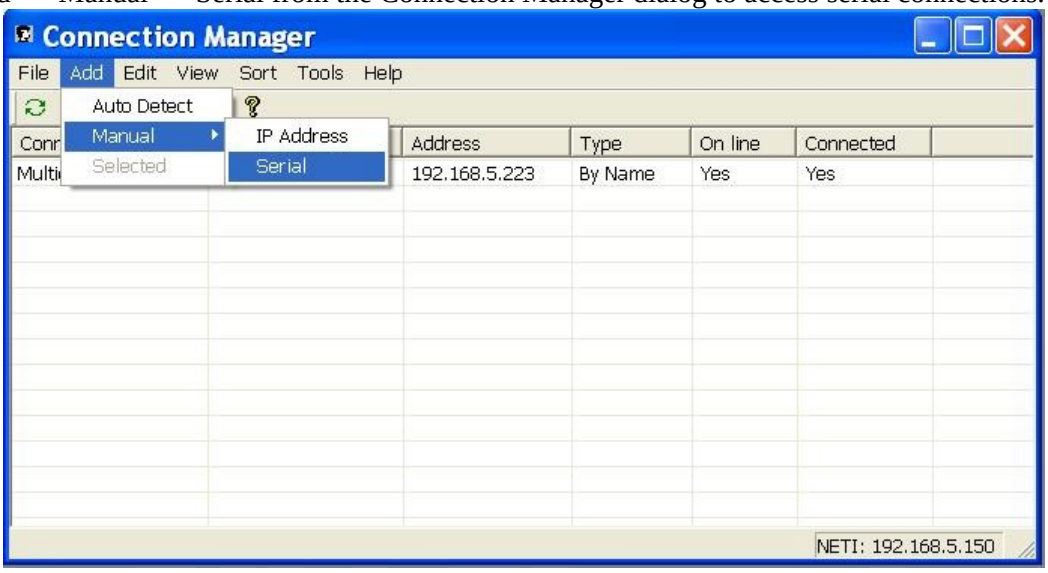


Setup for Serial Connection

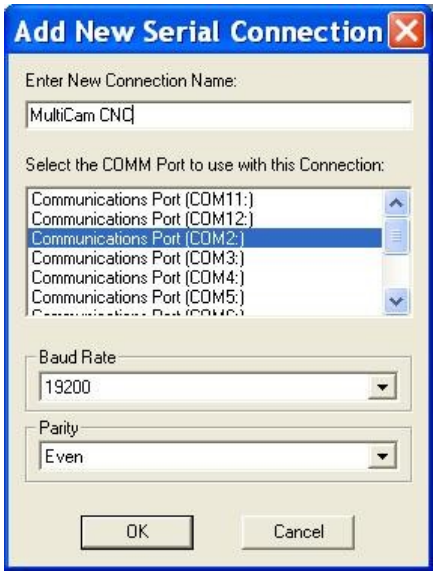
The serial communication is set up through Machine Tools. Ethernet communication is always recommended over serial, but operators may need to use serial connections for troubleshooting or quick-fixes for communication.

1. Right-click on the Machine Connections icon in the toolbar and select Connection Manager.

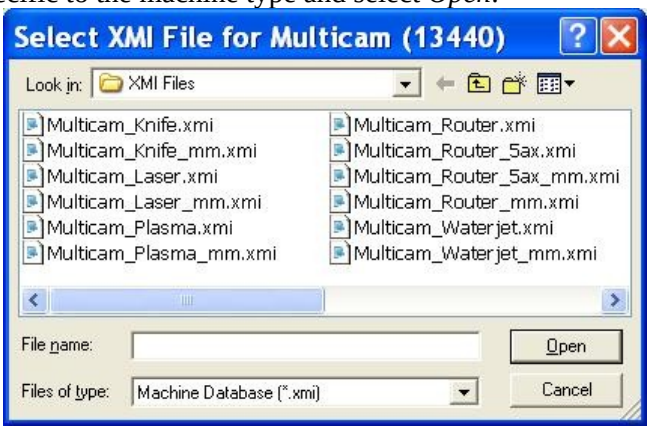
2. Select Add >> Manual >> Serial from the Connection Manager dialog to access serial connections.



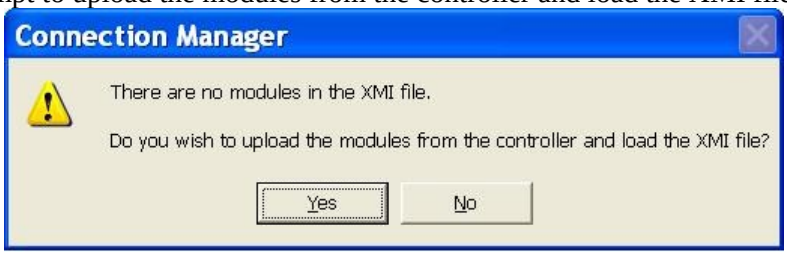
3. Enter or select the following information and select *OK*:
   - Connection Name (e.g., MultiCam CNC)
   - Communications port (e.g., COM2)
   - Baud Rate – 19200
   - Parity – Even



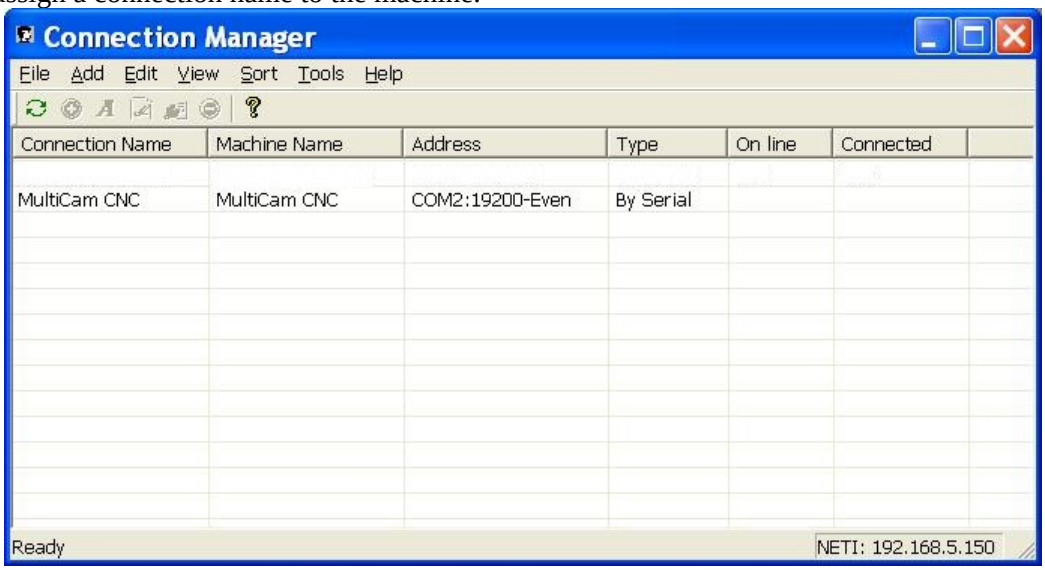
4. Highlight the XMI files specific to the machine type and select *Open*.



5. Select *Yes* at the prompt to upload the modules from the controller and load the XMI file.


Connection Manager
There are no modules in the XMI file.
Do you wish to upload the modules from the controller and load the XMI file?
Yes
No

This will assign a connection name to the machine.



Connect

Communication Troubleshooting

The ***MultiCam*** CNC machine is shipped with no connectors, and operators should purchase a 25' serial cable containing 9 wires to connect the ***MultiCam*** Controller to the Host PC. Data is sent from the computer to the machine controller. The data leaves the computer, passes through the computer Com Port or serial port, and moves through the serial cable and into the controller. Occasionally, operators experience difficulty when the machine does not accept a file, is unable to access DNC, loses connection, never establishes connection, or cuts off in a straight line in a manner that is not part of the original output file.

Most Common Reasons for Communication Failure

If the machine works some of the time but experiences random problems, then the machine may be experiencing some sort of communication problem. Here is a list of the most common problems for communication failure. Operators are encouraged to refer to this file before calling the local support technician or the ***MultiCam*** Technical Support.

* The Windows Com Port settings, especially the FIFO buffer, are not correct. See Communications Port Settings of Windows.

* The serial cable is longer than 100ft and is used without a Line Amplifier. See Serial Line Amplifier.

* The serial cable has been operated next to high voltage or fluorescent lights.

* The cable has been nicked, cut, or damaged in some fashion. See Serial Cable Construction.

* The wrong Com Port has been selected on the host PC.

* The Com Port IRQ conflicts with a modem installed in the host PC.

* The internal ribbon cable inside the machine control cabinet has been damaged or has lost its connection.

* The Max202 chip on the control board has failed.

Troubleshooting

The process of elimination is often used when troubleshooting various communication problems as more than one problem may have caused the current machine difficulty and different types of machines will respond differently to similar communication problems. The serial ports in the machine and in the computer could be damaged by a bad electrical storm or a comparable natural occurrence, and this damage will not always be fixed the same way for each machine. Below are common sites for communication problems and suggested ways to repair the damage.

Port Settings should be checked to verify that port settings and communication settings are correct.

* Machines that were manufactured after January 1996 have the following communication settings:
  Baud rate: 19200; parity: even; data bits: 8; stop bits: 1

* Machines that were manufactured before January 1996 have the following communication settings:
  Baud rate: 9600; parity: none; data bits: 8; stop bits: 1

Cable Testing 1 can be started with unplugging the serial cable from the side of the machine and plugging it back in before unplugging the serial cable from the back of the computer and plugging it back in. If the communications are still not working, Cable Testing 2 may help.

Cable Testing 2 involves opening the control box to inspect the cable connection extending from the side of the box where the external serial cable is plugged into the control board. This cable will be a ribbon cable plugged into the control board labeled G960, M10, M23 or M24. The connection going into the board can be unplugged and plugged back in. On many systems, there is an additional small ribbon cable extending from the top control board to the bottom control board that can also be tested. If the communications are still not working, Computer Port Testing 1 may help.

Computer Port Testing 1 for a computer with 2 serial ports involves plugging the machine into the other serial port and changing the port setting in DNC or the machine file output software. **Computer Port Testing 1** for a system with a serial port mouse involves plugging the mouse into the old port associated with the CNC machine. Windows should find the mouse automatically. If the machine works and the mouse does not, then the computer Com Port is probably bad and will need to be repaired by the computer vendor. If the communications are still not working, Computer Port Testing 2 may help.

Computer Port Testing 2 involves unplugging the serial cable from the side of the machine control box and plugging the loop-back plug provided in the tool box into the open end of the serial cable. After going to a DOS prompt, the operator should change directories to the mc directory (cd\mc) and run COMCHK.EXE. This will test the serial port and the cable. If the communication status is bad, errors will display on the screen. These errors could point to a faulty cable or a computer serial port. The test can be ended by pressing the ESC key. If the communication status is good, a continuous line of dots will appear along the bottom of the screen. If this happens, Machine Port Testing may help.

Machine Port Testing involves unplugging the serial cable from the computer and plugging the loop-back plug provided in the tool box into the open end of the serial cable. The collet and cover nut from the spindle should be removed, and the machine should be turned off and back on. If the machine enters self-test and begins to move, then the machine communications and serial cable are okay. At this point, the operator can probably assume there must be a problem with the computer Com Port or associated settings. If this process does not work, then 1 of 3 things have happened:

1. The serial port chip is bad and needs to be replaced. ***MultiCam*** can be contacted for the chip and installation instructions.

2. The internal ribbon cable connections have been damaged.

3. There is no self-test file loaded in the controller. ***MultiCam*** can be contacted for additional Help.

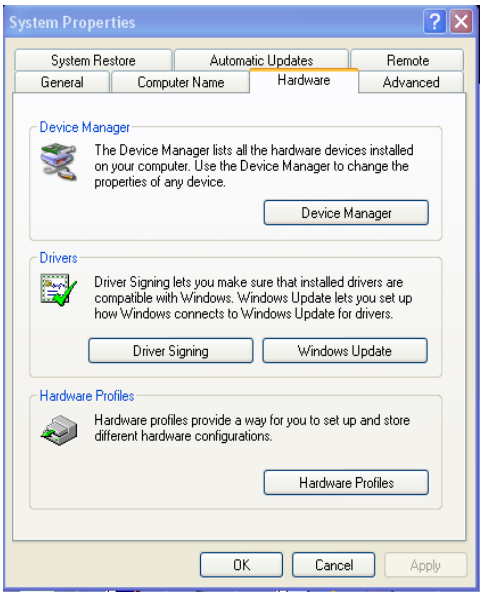
Connect

Communications Port Settings of Windows

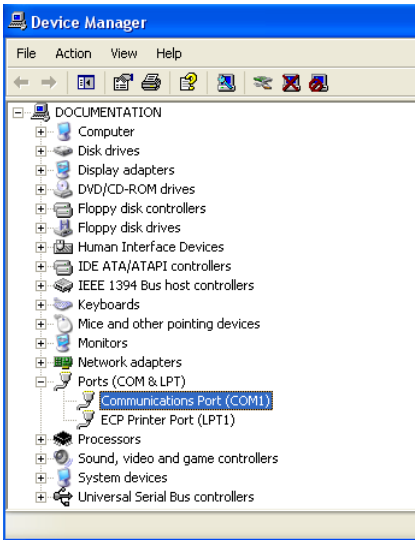
Most PCs are running Windows 2000 or higher as the Operating System. The default configuration of Windows is set to take advantage of larger (16 byte) FIFOs in the COM ports.

The ***MultiCam*** Controller has 4 to 7 character-receive FIFOs, which is less than half the standard default setting. Operators should reduce their Transmit FIFO levels when using a ***MultiCam*** Controller to lessen the chance for poor communications or loss of data that would result from having the settings too high.

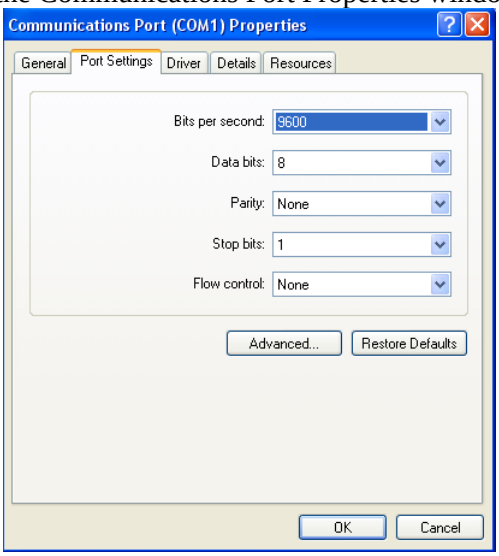
1. Right-click on the My Computer icon from the Windows Desktop, select the Hardware tab, and select *Device Manager*.


System Properties
System Restore
Automatic Updates
Remote
General
Computer Name
Hardware
Advanced
Device Manager
The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.
Device Manager
Drivers
Driver Signing lets you make sure that installed drivers are compatible with Windows. Windows Update lets you set up how Windows connects to Windows Update for drivers.
Driver Signing
Windows Update
Hardware Profiles
Hardware profiles provide a way for you to set up and store different hardware configurations.
Hardware Profiles
OK
Cancel
Apply

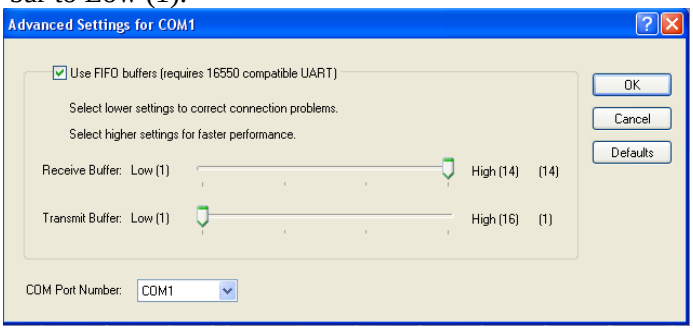
2. Select Ports (COM & LPT) and then select Communications Port (COM1) or the port to which the ***MultiCam*** Controller serial cable is connected.



3. Select the Port Settings tab from the Communications Port Properties window and select *Advanced*.



4. Drag the Transmit Buffer bar to Low (1).


Advanced Settings for COM1
Use FIFO buffers (requires 16550 compatible UART)
Select lower settings to correct connection problems.
Select higher settings for faster performance.
Receive Buffer: Low (1) High (14) (14)
Transmit Buffer: Low (1) High (16) (1)
OK
Cancel
Defaults
COM Port Number: COM1

5. Select *OK* to all the windows that were opened and restart Windows to activate this setting. Connect

Serial Line Amplifier

MultiCam recommends using the Bravo Line Amplifier or a comparable serial line amplifier and requires a line amplifier when the serial cable reaches or exceeds 100'. Not using the line amplifier will create communication problems between the host PC and the ***MultiCam*** CNC machine as too much load will be placed on the Com Port as well as on the Max202 chip of the ***MultiCam*** Controller.

The installation of the serial line amplifier involves the AC power adapter, line amplifier, DB25 female to DB9 male adapter, a 6' adapter cable with a DB25 male connector and DB25 female connector, and a serial cable with a DB9 male connector and DB9 female connector.

1. Flip the line amplifier over and make sure that the 2 switches are positioned towards the middle of the line amplifier.

2. Place the DB25 male connector of the 6' adapter cable into the "To DTE" end of the line amplifier.

3. Place the DB25 female connector on the other end of the 6' adapter cable into an available Com Port of the PC.

4. Place the DB25 female end of the DB25 female to DB9 male adapter into the "To DCE" end of the line amplifier.

5. Place the DB9 female end of the serial cable into the DB9 male end of the DB25 female to DB9 male adapter.

6. Insert the AC power adapter plug into the socket on the line amplifier and plug it into an AC outlet.

Connect

Serial Cable Construction

Operators should avoid installing serial cables next to high voltage lines and should prevent any foot traffic from occurring over or across the serial cables. The serial cable should not be involved in a situation where damage is probable, and operators who create their own serial cables should not exceed 100'. Serial cables that exceed 100' require the assistance of line amplifiers, and ***MultiCam*** has tested lengths of serial cable up to 1000' that utilized serial line amplification.

The following is the pin out for the ***MultiCam*** serial cable. In both cases, Pin #9 is not used.

Computer End, DB9 Female

Pin #	*Color*
1	(not used)
2	Red
3	Blue
4	White
5	Yellow
6	Black
7	Orange
8	Brown

Machine End, DB9 Female

Pin #	*Color*
1	(not used)
2	Blue
3	Red
4	Black
5	Yellow
6	White
7	Brown
8	Orange

Connect

Serial Communication

The ***MultiCam*** Controller can communicate with a host PC through an RS232 Serial or Com Port. The serial port transmits one bit at a time spread out serially over time. Since only 1 bit rather than 8 is transmitted at a time, only 1 data line exists in the cable for each direction of travel with 2 lines total. A half-duplex allows only 1 data line enabling communication in 1 direction at a time, while the full-duplex allows 2 data lines enabling simultaneous communications in both directions. Thus, a serial port cable is thinner than a parallel port cable.

The port is called an RS232 port because the electrical characteristics follow the EIA Recommended Standard #232, which specifies the operating voltage (± 12V), relative to a common reference. Other details, such as impedance and driver capacity, are specified in this standard.

The controller's default configuration for options within the standard is 8 data bits, 1 stop bit, no parity, full-duplex, and hardware handshaking. Baud rates supported are 9.6K, 19.2K, 38.4K, and 57.6K bits per second with the standard setting being 19.2K.

The controller operates better when the device transmitting the motion commands obeys DTR hardware handshaking. The sophisticated processing and motion firmware provides continuous motion under most circumstances. In the event that additional processing time is required by the controller and the incoming character buffer fills, the DTR handshaking line will go low to prevent further transmissions of commands from the host PC. When the controller has processed enough of the incoming character buffer, it will then raise DTR and the host PC will resume transmitting.

Connect

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Software

The ***MultiCam*** Laser can use files created from many popular software packages in the industry, such as AlphaCam and EnRoute, as well as files created in G Code and HPGL. The productivity suite enhances communication between the ***MultiCam*** Laser and the host computer. Software

AlphaCam Post Processor Installation

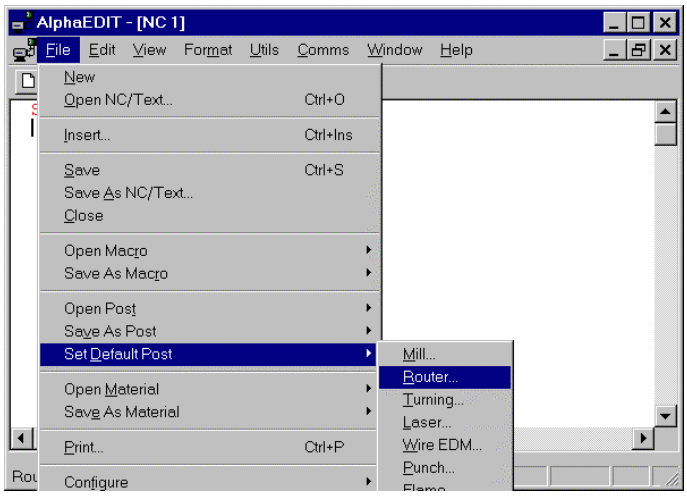
MultiCam offers 2 AlphaCam post processor systems for use depending on the type of post system in the machine. The ***MultiCam*** ATC-ARP post processor interfaces with both ATC and multiple head systems while the ***MultiCam*** ARP post processor interfaces with single head systems and outputs a manual tool change command so that multiple tool change files can be run on single head systems.

Multiple Post Systems

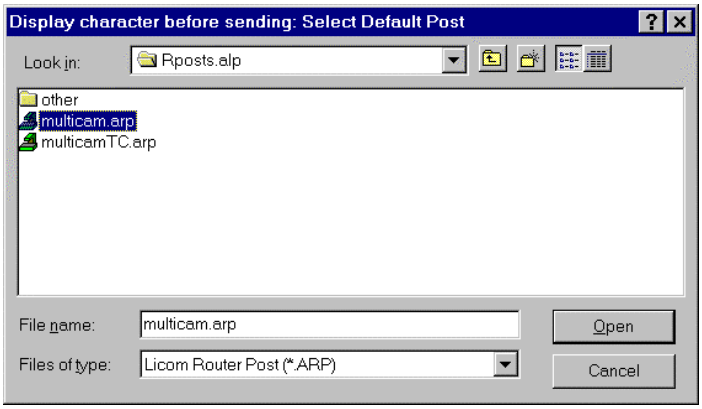
1. Copy the appropriate post processor located in Software Drivers/AlphaCam from the ***MultiCam*** Installation CD into the LICOMDAT/RPOSTS.ALP directory using Windows Explorer.

2. Start the Alpha Edit program from the AlphaCam folder in the Windows Start menu once the post processor is copied.

3. Select Set Default Post/Laser from the file menu in Alpha Edit



4. Select the desired post processor from the list. Select *Open*. This will set the selected post processor as the default.



Single Post Systems

1. Contact ***MultiCam*** or one of its authorized distributors for a copy of the OnePost file to use with the single post system.

2. Copy the encrypted OnePost file into the LICOMDAT/RPOSTS.ALP directory. This file has no extension.

3. Verify that AlphaCam completes the auto detect of the single post system post processor once the file is copied into the RPOSTS.ALP directory.

Software

EnRoute Driver Setup

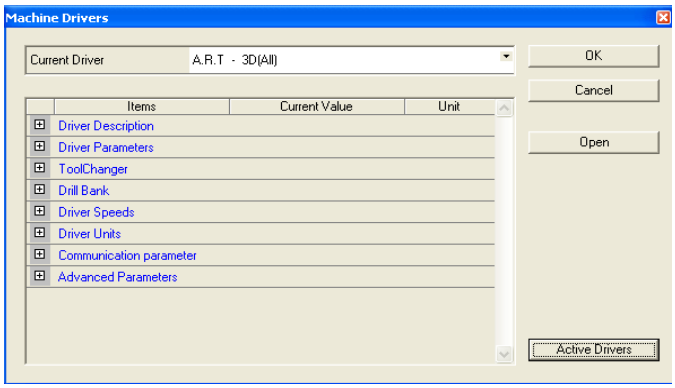
The EnRoute software package is used to assist operators in creating job files for the ***MultiCam*** Laser. Each operator must have an installation CD to set up the capability and a dongle to connect with the host PC each time the program is run.

Verifying Computer Compatibility

1. Refer to the EnRoute Recommended System Requirements to make sure the host PC is compatible with the software package.

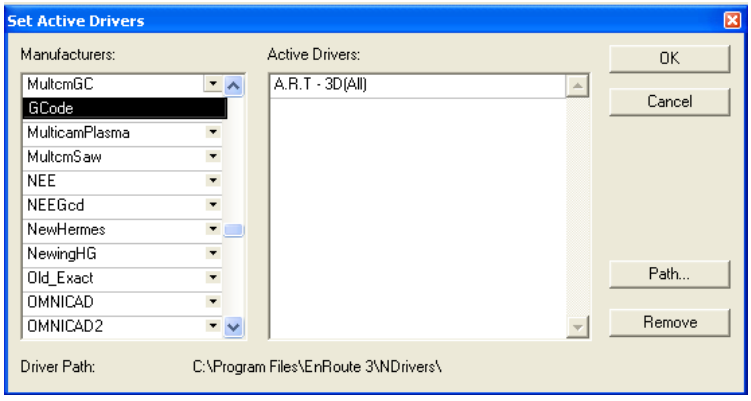
2. Open EnRoute and select Setup/Machine Setup from the toolbar at the top.

3. Click *Active Drivers* in the Machine Drivers dialog.



4. Scroll down on the left side to MultcmGC in the Manufacturers Window.

5. Click on the down arrow to the right of MultcmGC and double-click GCode.



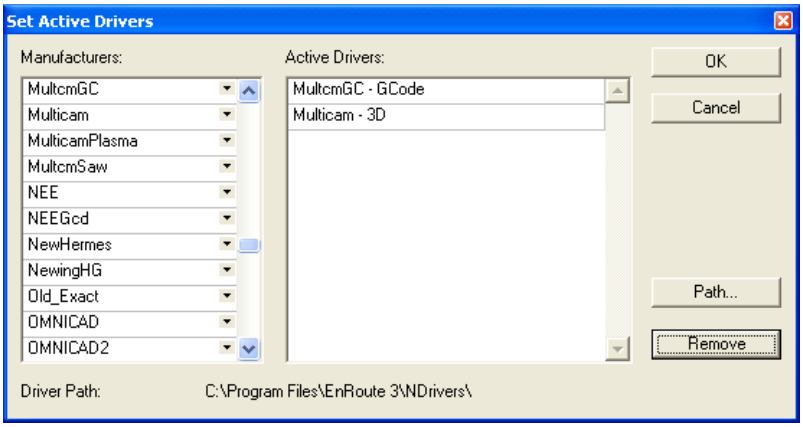
This will add MultcmGC/GCode to the active drivers list on the right.

Selecting the Driver

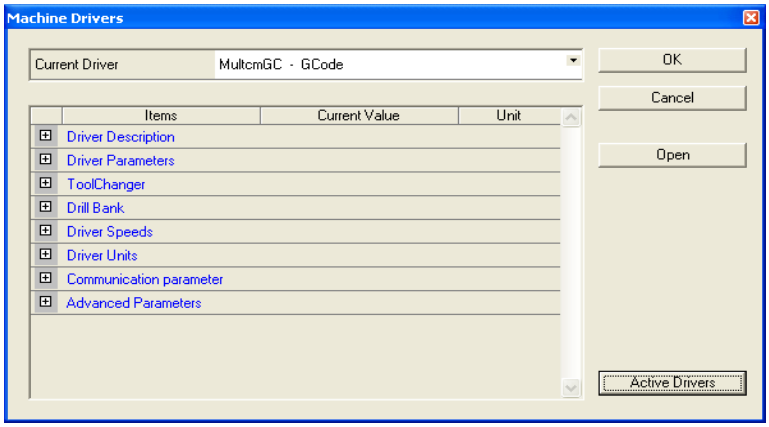
1. Select the appropriate driver based on the system requirements (e.g., Multicam - 3D Driver [HPGL]).
   a. Multicam – 2D uses the ***MultiCam*** 2D Driver for machines that **do not** support 3D and will override all cut parameters set at the keypad.
   b. MultiCam – 3D uses the ***MultiCam*** 3D Driver for machines that **do** support 3D and can be used for cutting bridges, multiple-pass cuts, or 3D machining. This driver will output all cut parameters (e.g., X,Y,Z cut speeds, depth, lift, spindle speed, and dwell) and will override any parameters set at the keypad.
   c. MultiCam – No Depth can be used on 2D and 3D ***MultiCam*** machines and will only output the tool path without outputting any cut parameters (e.g., X,Y,Z cut speeds, depth, lift, spindle speed, and dwell) regardless of their settings in EnRoute. All settings must be set on the keypad pendant. This driver will not output 3D.

2. Highlight the default driver (e.g., A.R.T. 3D [All]) and select *Remove*.

3. Select *OK* to accept the appropriate ***MultiCam*** GC/GCode driver.



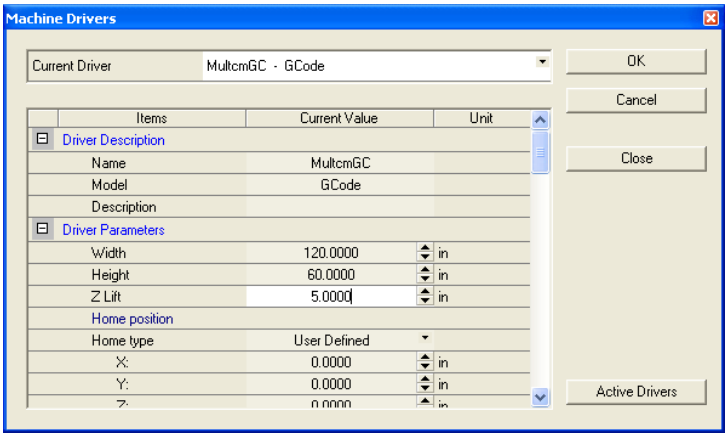
4. Select *OK* to return to the Machine Drivers dialog. The selected driver should be listed at the top.



Adjusting Table Settings

1. Select *Open* to adjust the table settings.

2. Scroll down to Driver Parameters and change the width, height, and Z lift to match the table.
   a. Width = X-axis (front to back; long side of the table)
   b. Height = Y-axis (left to right; short side of the table along the gantry)
   c. Z lift = Z-axis (up and down; Lift Height above the table)



3. Make sure the dimensions are correct before completing setup.

Completing EnRoute Setup

1. Select *OK* in the Machine Driver Dialog to finish the EnRoute Setup.

2. Make no changes to the Driver Units section as the system is configured with default settings and will not work if these settings are changed. The operator can modify the settings under Preferences or the view setup F10.

EnRoute View and Preference Settings

While ***MultiCam*** recommends different settings for standard configurations, the operator is able to review the condition of the cutting sequence and the setup before the cutting sequence begins.

View Options

* Check the screen views to view the associated rulers. The rulers are used to verify size and positioning relative to the location in that Layout View.

* Scroll up, down, left, or right to pan the viewing area without moving the contours.

Toolbars

* Select Setup/Toolbars to choose a toolbar in order to view or hide it. All toolbars will be shown by default.

* Move a toolbar to the desired location by holding down the left mouse button on the dividing line that separates each bar and dragging it. Once the toolbar is close enough to one of the outer edges of the EnRoute window, the toolbar will snap to it, rotating itself accordingly, and the operator may simply release the mouse button.

* Drag the toolbar to the layout viewing area and release it to the title bar at the top. The toolbar can then be grabbed by clicking and holding down the left mouse button.

* Return to the default settings by selecting Setup/Toolbars/Reset to Defaults.

The Preference Settings available in EnRoute 3 (i.e., General, Initialization, Display, Units, Grids, View Setup, Start Points) are used to maximize or speed up the process in which the operator creates a design and applies the tool paths. While the operator has the final say in setting up the program, ***MultiCam*** recommends the following configurations. More information on a particular setting is available by pressing F1 Help, selecting the Search tab, typing in the tab name (e.g., General tab), and double-clicking the tab name under List Topics.

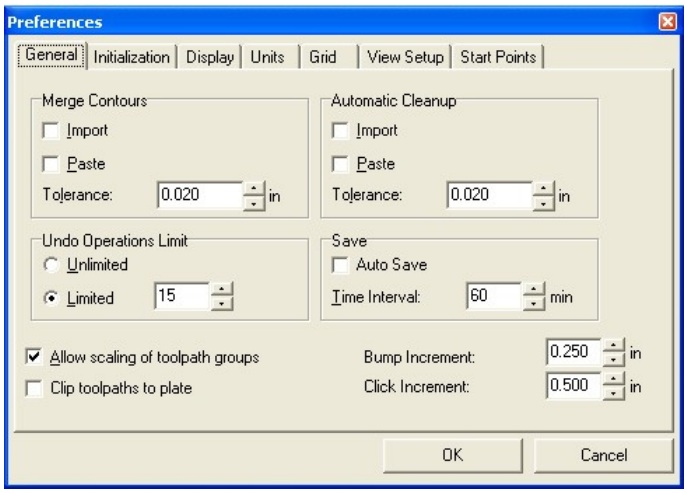
General

* Uncheck Merge Contours and Automatic Cleanup options since they may distort or join contours. Both the Merge and Cleanup options, found under Transform, can be completed once the artwork is successfully brought in.

* Undo Operations Limit due to PC resources and slow operation time. The Limited section should be set around 15 or 20 undos, though the operator would probably be better off starting over if he or she must undo more than 10 times.

* Undo Allow Scaling of Toolpath Groups to prevent using up resources. Toolpath is included in the size when scaling these groups, and it may be better to delete the toolpaths and rescale the contours.

* Determine where Clip Toolpaths to Plate is necessary since it allows the operator to output only the toolpath groups that are on the plate. This is useful when creating jobs that are too big for one sheet of material but should be kept together. An out-of-bounds message can occur when the operator is running a file as a closed contour, though parts of the file are not cutting, because either the toolpath option is checked or the toolpath is hanging off the plate.



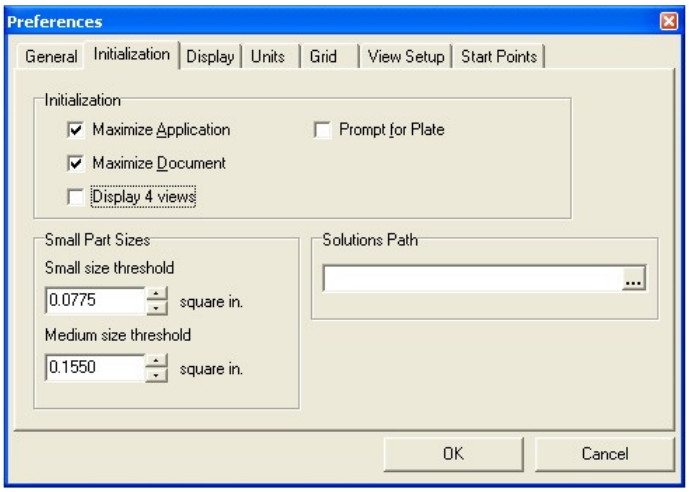
Initialization

* Select Maximize Application and Document to open the program and any files at maximum window size.

* Reserve the Display 4 Views option until toolpaths are in place and a particular view should be seen normally. Display 4 Views will show the top, front, side, and perspective view when opening, importing, or starting a new file.

* Select Prompt for Plate so that the system will prompt at the start of a file to define a plate or material size. A plate does not have to be defined and can be handled when nesting objects or running the 3D simulation. The Clip to Plate option should be unchecked when not defining a plate.

* Avoid changing the default settings for Small Part Sizes.

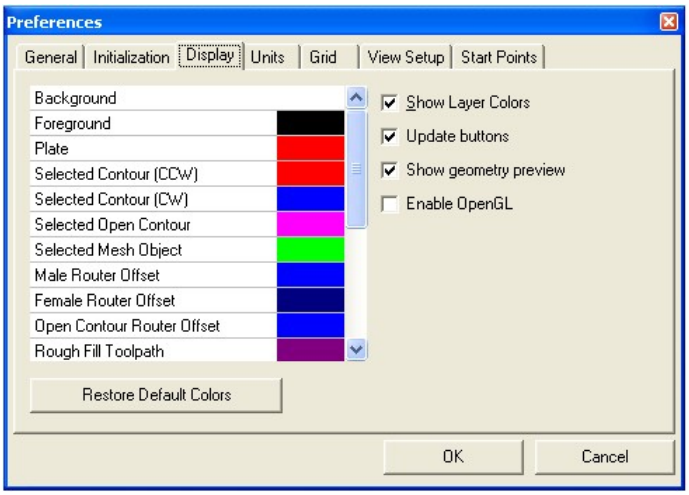


Display

* Avoid changing the Display Settings from the default setting.

* Double-click the individual Colors to make any preferential changes for contour appearance during viewing.

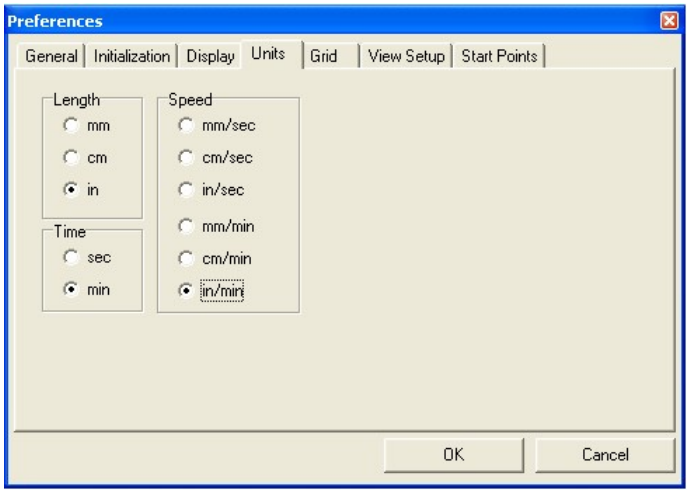
* Leave the 3 options to the far right checked in order to make certain commands user friendly and more functional.



Units

* Adjust the Length Time and Speed only when working with metric systems as most companies in the US use inches per minute, which is also the basis for most tool catalog formulas.

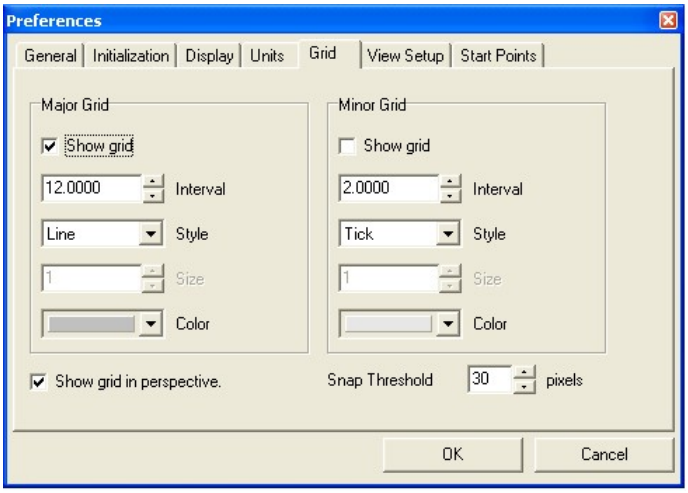
* Change unit measurements in this window only. Operators should avoid making any changes in the Machine Setup/Driver configuration.



Grid

* Change the Major and Minor Grids when creating contours in Contour Creation, which can be turned off when not in use.

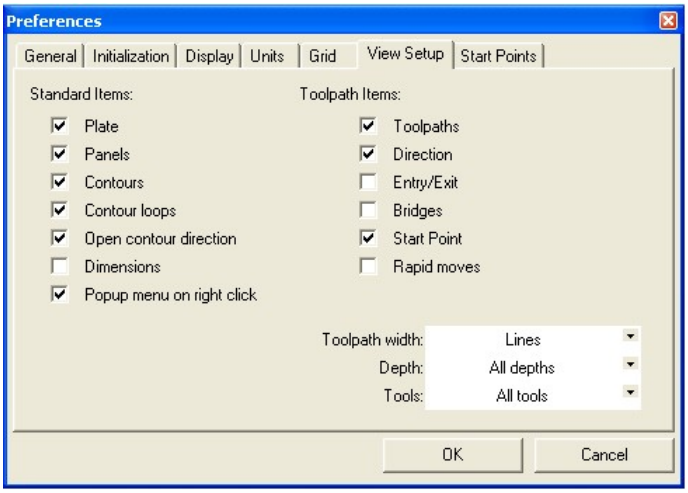
* Review the parameters of the grid. The Interval describes the size of the grid while Size describes the pixel size of the Style.



View Setup

* Adjust View Setup settings to show or hide the listed items when creating contours and toolpaths.

* Avoid changing the options in the white window until all paths and options for them have been created. At that point, these settings can be changed to see only certain paths with these 3 options.

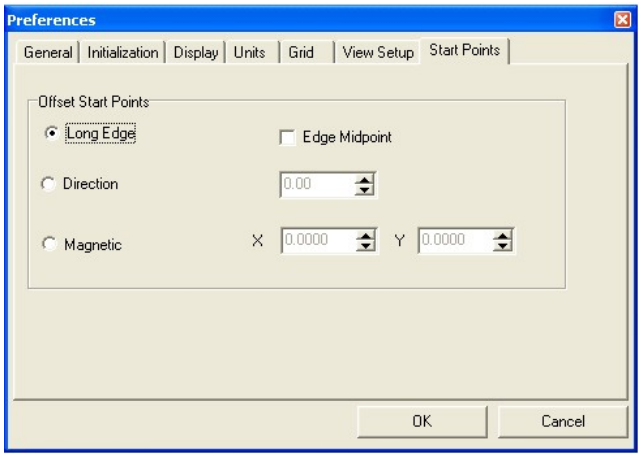


Start Points

* Avoid changing the Start Points settings from the default setting since these offset points can be adjusted manually during the cutting sequence.

* Review the Long Edge configuration as this places the start point on the longest edge of the geometry.

* Select the Edge Midpoint only if the start point should be relocated to the middle of the longest edge.



Software

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MultiCam Software

The ***MultiCam*** software installation CD contains the ***MultiCam*** motion controller software, which provides the interface between the computer and the ***MultiCam*** Laser. The installation CD also contains machine schematics, software drivers, and a routing guide that contains cutting tips. Before installing the ***MultiCam*** software, customers should make sure there are no other applications open on the computer. Internet Explorer v5.5 or newer is required for this installation.

A. Insert the ***MultiCam*** Installation CD into the CD-ROM drive. This will normally cause the computer to read the CD and then direct the customer through the commands for installation.

B. Follow these steps if the installation does not start automatically:

1. Select the Windows Start button at the bottom left of the screen.
2. Select *Run*.
3. Select *Browse* on the Run Dialog box.
4. Select the MultiCam Installation Folder from the directory.
5. Select Setup.Exe.
6. Select *Open*.
7. Select *OK* on the Run dialog box.
8. Follow the setup menus for a complete installation of the ***MultiCam*** software.

Software

Motion Controller Utilities

The ***MultiCam*** software was developed to allow the operator more options and to interface with the newer Windows software. In addition to supporting the DNC function, the ***MultiCam*** software also has options for digitizing, as well as a file Previewer, Job Reporter, bar code scanning, and tool diameter compensation. These tools are all written in 32-bit code and run directly from Windows 2000 or higher.

PSS

JobServer
JobPreviewer
JobReporter
MotionMechanic
Machine Connections

Suite 4

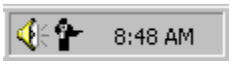
JobNameServer
JobEditor
JobReporter
MotionMechanic
ConnectionManager
JobConsole

Software

JobServer

JobServer is ***MultiCam's*** interface between the computer and the ***MultiCam*** Laser. JobServer is the PC automation tool for the ***MultiCam*** Motion Controller with specific Control Settings and Project Settings.

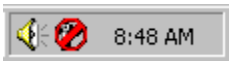
JobServer runs unnoticeably in the Windows System Tray on the computer and handles operations between the host computer and the ***MultiCam*** Laser.



JobServer was designed to handle DNC and Digitize without the user having to monitor the host computer. While JobServer handles HotWatch and JobQueue operations, HotWatch must be activated by the operator, and JobQueue requires the operator to select job files to queue and then start the created queued files.

JobServer will generally be started by a shortcut in Windows Start/Programs/StartUp folder. This shortcut will be created during installation of the software.

JobServer will automatically release the configured Com Port and enter a sleep mode when another program accesses the port. This allows JobServer to remain running while other programs are used to access the controller. When in sleep mode, the system tray icon will appear like this:



When JobServer is not in sleep mode, DNC and Digitize are always active and waiting for the controller to request them. HotWatch can be configured to always watch the Inbox. The only component that requires user interaction on the host computer is JobQueue.

Advanced Information

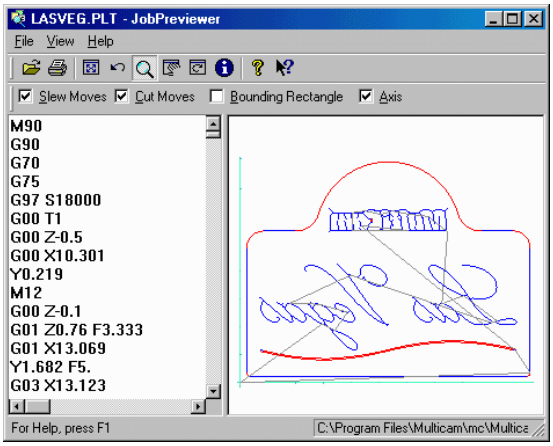
"C:\MultiCam\MC\JobServer.exe" /C="Unknown"

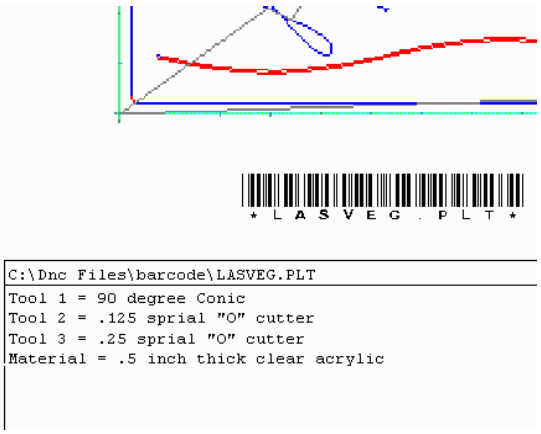
If the JobServer path has spaces in it, the operator must be sure to quote the path as shown above. The /C= switch denotes the Connection Name. If the Connection Name has spaces in it, the operator must be sure to quote the Connection Name also.

Innovation. Quality. Performance. Best in Industry. Worldwide.

JobPreviewer

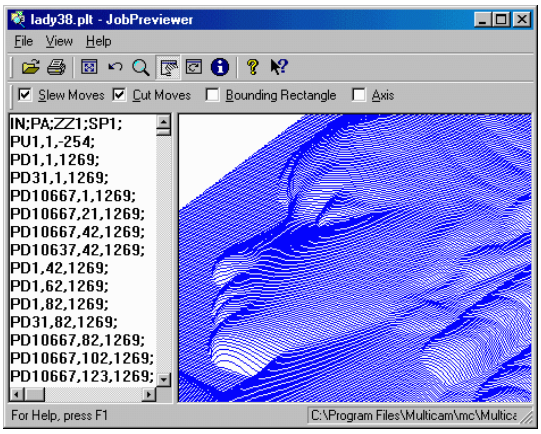
The ***MultiCam*** JobPreviewer allows the operator to preview the job before it is sent to the laser. This is an excellent way to verify the G Code or HPGL Code before the file is cut. The preview will simulate the machine code and display a graphic representation to the operator. To assist with job optimization, the operator can display the machine slew moves to verify the efficiency of the file. The program will also count the number of slew moves, arcs, and lines in a cut file.




* L A S V E G . P L T *
C:\Dnc Files\barcode\LASVEG.PLT
Tool 1 = 90 degree Conic
Tool 2 = .125 sprial "O" cutter
Tool 3 = .25 sprial "O" cutter
Material = .5 inch thick clear acrylic

JobPreviewer can also be used to produce shop floor work orders. Printed work orders can be used to communicate with customers and employees as well as providing special instructions for the work. The work order contains a graphical representation of the cut file, tool specifications, material descriptions, and user notes. This ability of the JobPreviewer can further improve shop floor management if the optional bar code scanning interface is added. The operator will be able to scan the bar code on the bottom of the work order at the machine, and DNC will automatically access the correct job and begin the cutting sequence.

JobPreviewer supports full 3-axis milling and can be used to view the 2D- and 3D-tool path before the job file is processed on the machine.

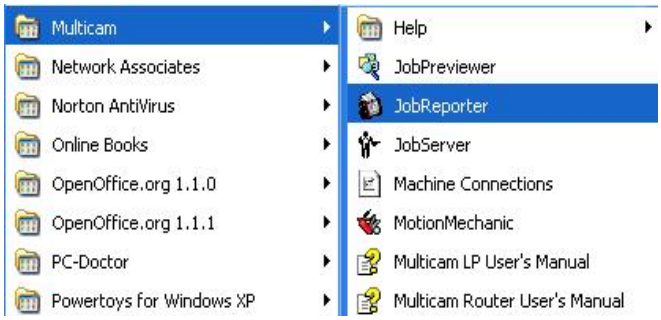


Software

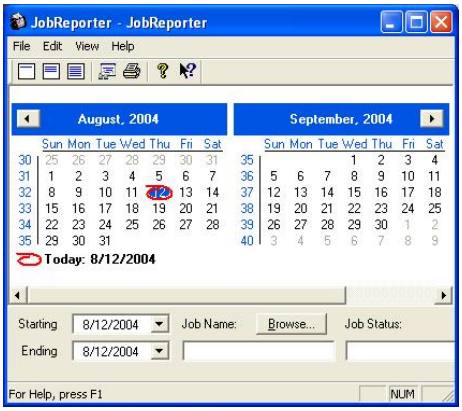
JobReporter

The JobReporter interface analyzes the data collected by DNC, HotWatch, and JobQueue from a simple calendar interface. Daily, weekly, monthly, and yearly reports can be produced. Reports are broken up into multiple work shifts and can even track a specific job. Once the report is created, the data can be exported using many popular spreadsheet or database formats.

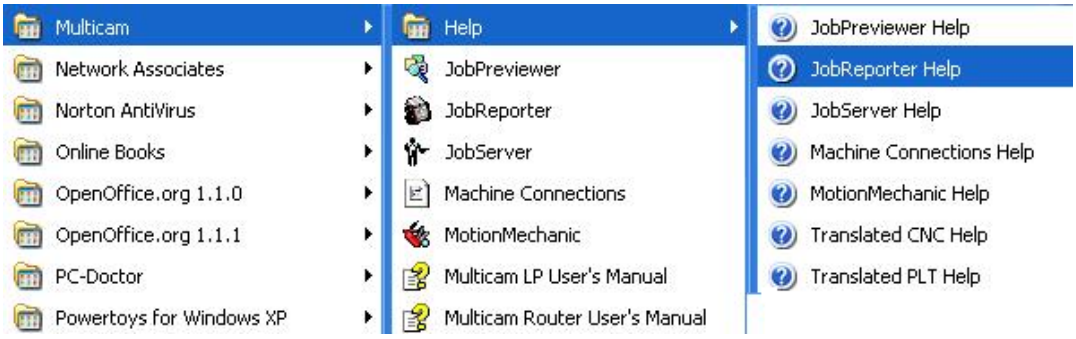
1. Click Start/Programs/MultiCam/Job Reporter to access the Job Reporter function from the main JobReporter screen.



2. Select *Help* on the tool bar or press F1 for detailed instructions once the JobReporter program has been opened.



3. Click Start/Programs/Multicam/Help/JobReporter Help to launch help directly from the ***MultiCam*** folder.



Software

MotionMechanic

The MotionMechanic application gives the operator advanced technical control over the use and setup of the motion controller from a host PC with several specialized functions.

Operators can verify that MotionMechanic is active on the PC by locating the MotionMechanic icon in the Windows systems tray at the bottom left.

Terminal Emulator provides direct access to the controller for development, diagnostics, or troubleshooting.

Text File Editor views, edits, or develops files related to the controller on the host PC. Files to be edited include job files, configuration files, and any ASCII text file.

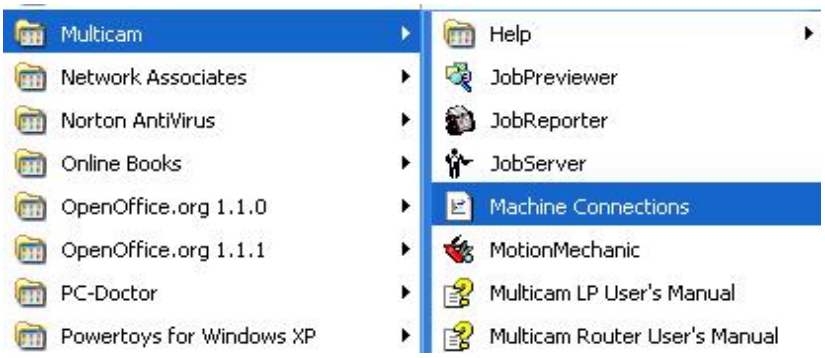
Session Log keeps a record of communication error statistics used for troubleshooting communications problems. Session logs are stored between sessions of MotionMechanic.

Software

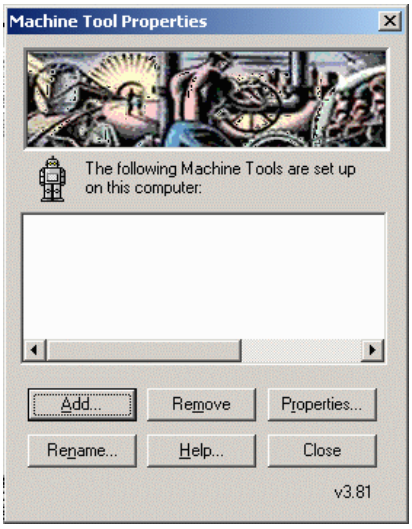
Machine Connections

The Machine Connections applet is located under the ***MultiCam*** folder and in the Windows Control Panel.

1. Click Start/Programs/MultiCam/Machine Connections to access the Machine Connections applet.



2. Press *Help* for a detailed description of each button in the main Machine Tool Properties applet.



3. Click Start/Programs/Multicam/Help/Machine Connections Help to launch the Help function directly from the ***MultiCam*** file.

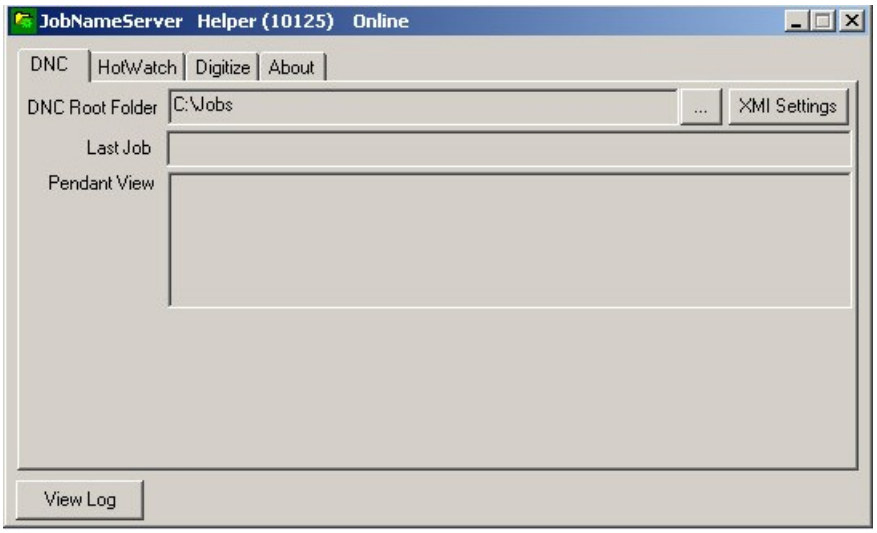
Suite4 Motion Controller Utilities

The PSS4 contains some additional features for standard PSS3 options and additional options with more advanced features. Operators can access additional information on these features in C:/Program Files/Machine Tools Suite4.

Software

JobNameServer

The JobNameServer program connects the operator with folders on the network or host PC by finding jobs quickly and executing them from the keypad. Other features of JobNameServer can help automate the production process. Operators can click on the tab and start a program or learn about the system.

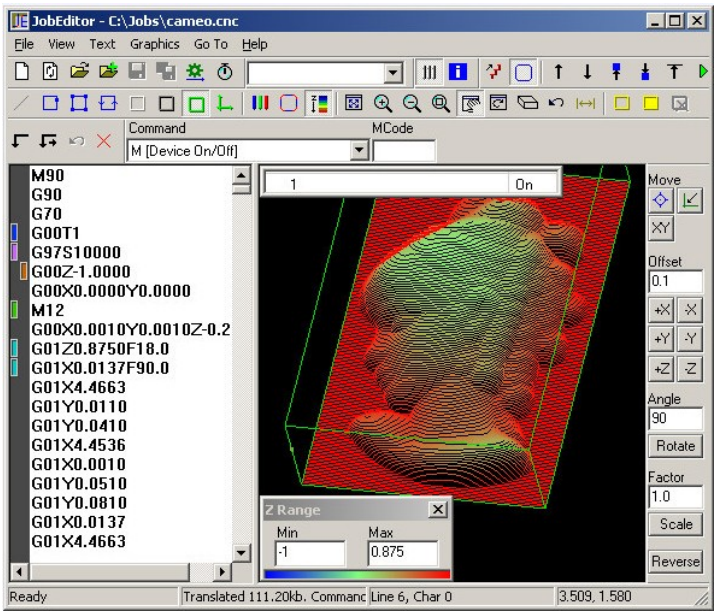


a. **DNC** allows the operator to select and execute jobs from the network or host PC using either a keypad or touch screen interface.
b. **HotWatch** helps automate the production process by monitoring a folder on the network and automatically executing jobs that are placed into that folder.
c. **Digitize** helps operators reproduce 2D and even 3D objects. Not all machines support Digitize, and operators can contact ***MultiCam*** for additional information. A machine supporting Digitize uses special sensors to scan the object and create a job file based on the object. Once the object has been digitized, the job file can be executed as many times as necessary
d. **About** shows the versions of JobNameServer and the associated files used by JobNameServer.

Software

JobEditor

The Job Editor application allows operators to preview and edit jobs through resizing, repositioning, or modifying current job files in any way.



Software

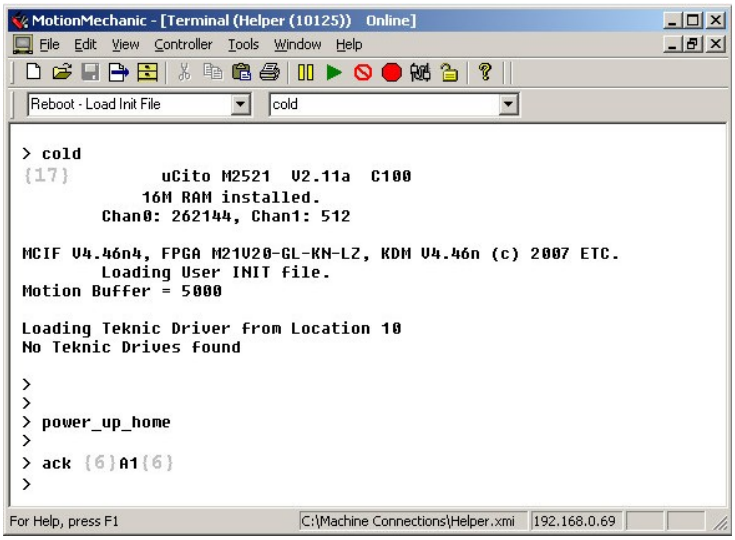
JobReporter

The JobReporter generates reports on machine use. The report results can be filtered and modified to obtain general or specific information about the machine usage.

Software

MotionMechanic

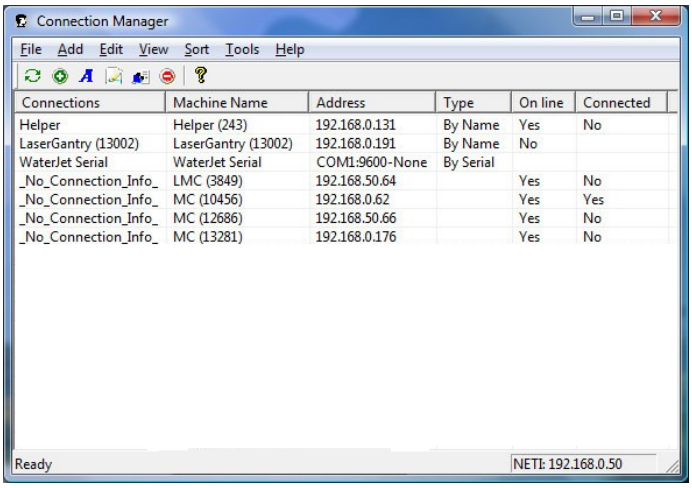
The MotionMechanic application provides the operator with advanced technical control over the use and setup of the motion controller from a host PC.



Software

ConnectionManager

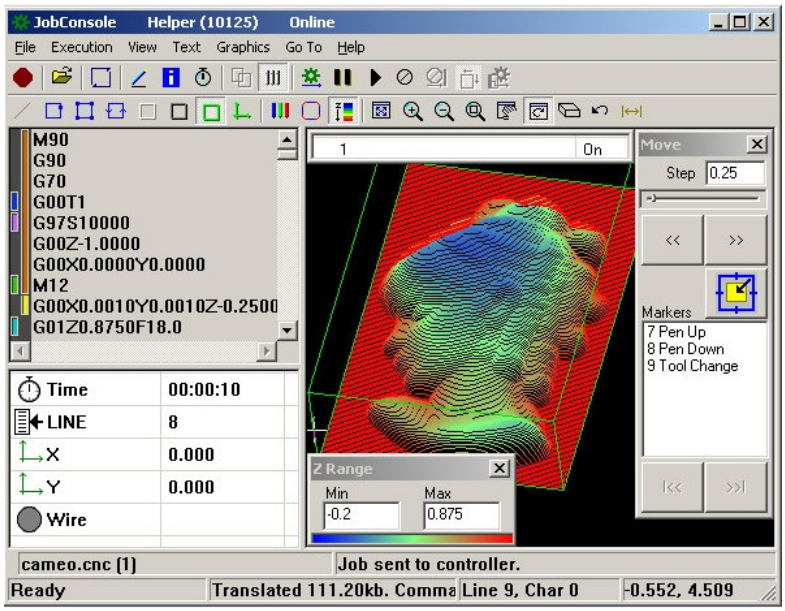
The ConnectionManager helps in creating and configuring the connection between a host PC and the machine tool and has built-in testing features for diagnosing communications issues and sending email correspondence for assistance. Operators can also establish one particular computer to be in charge of all communications, which is helpful if multiple computers are connected to a machine.


Connection Manager
File Add Edit View Sort Tools Help
Connections | Machine Name | Address | Type | On line | Connected
Helper | Helper (243) | 192.168.0.131 | By Name | Yes | No
LaserGantry (13002) | LaserGantry (13002) | 192.168.0.191 | By Name | No
WaterJet Serial | WaterJet Serial | COM1:9600-None | By Serial
_No_Connection_Info_ | LMC (3849) | 192.168.50.64 | Yes | No
_No_Connection_Info_ | MC (10456) | 192.168.0.62 | Yes | Yes
_No_Connection_Info_ | MC (12686) | 192.168.50.66 | Yes | No
_No_Connection_Info_ | MC (13281) | 192.168.0.176 | Yes | No
Ready
NET: 192.168.0.50

Software

JobConsole

The JobConsole program acts as the main graphical interface between a machine tool and the operator, allowing the operator to preview and execute jobs as well as monitor the job progress, pause and resume the job, move to a specific point in the job, and move through the job a single cut at a time.



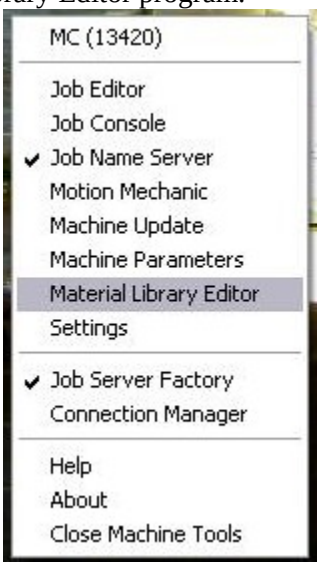
Software

Material Library Editor

The Material Library stores all the cutting parameters for various materials and thicknesses. These parameters are divided into several basic types of material. Under each type of material, operators can load various thicknesses and can attach cutting attributes (e.g., feedrate, power, cut height) to each type of thickness and material. The Material Library Editor in Suite4 allows the operator to manipulate the material library in order to add or remove a particular material or material thickness from the stored information on each machine. The following directions address how operators may add a material to an existing material library on a machine.

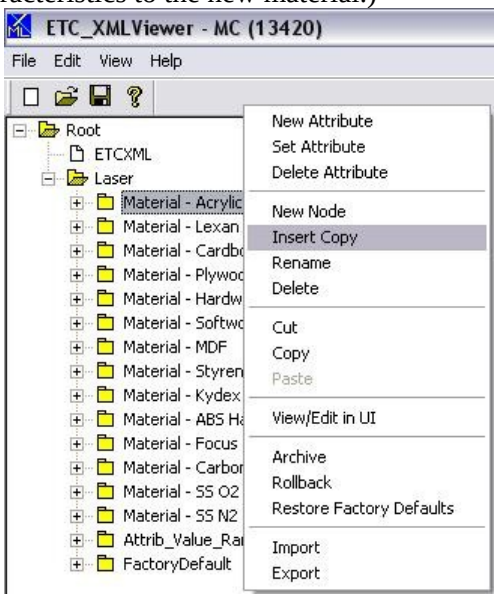
1. Leave the keypad at the home screen. Operators should **never change any material information from the keypad while the Material Library Editor is open on the computer**. Making changes at this time could delete the material library file from the controller.

2. Select Machine Tools >> Material Library Editor. From this screen, operators can add, edit, or delete material library information from the Material Library Editor program.

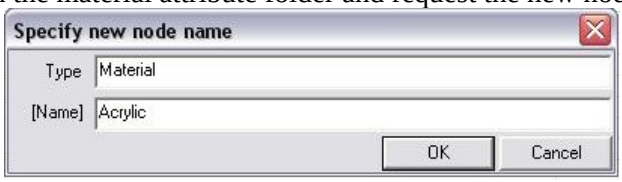


Saving the Material

1. Right-click on any material and select *Insert Copy*. (Since Material Library Editor copies the attribute information from the first material, operators should start with an existing material in the material library that has similar attributes and characteristics to the new material.)

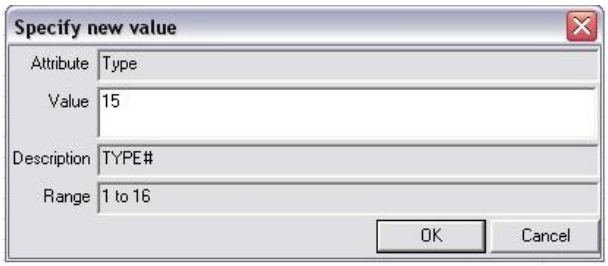


This will automatically open the material attribute folder and request the new node name.

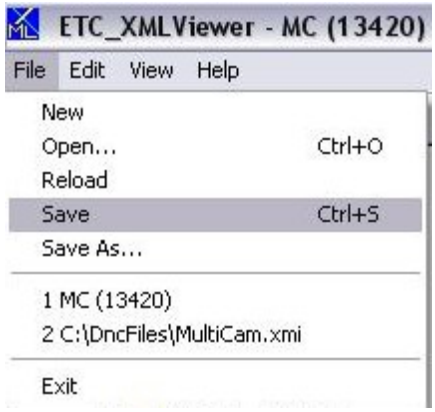


2. Correct the material name to show the new material type (e.g., Acrylic test) and select *OK*. While operators can enter material types with several characters, the first nine characters will be the only ones visible on the keypad screen.

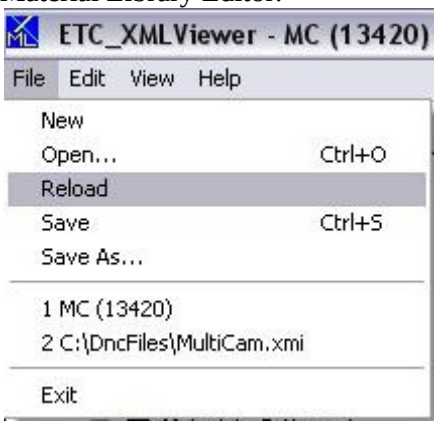
3. Double-click on the number shown under Value, correct that number to the next number in the sequence (e.g., 15), and select *OK*.



4. Highlight the material and select File >> Save.



5. Select File >> Reload and close the Material Library Editor.

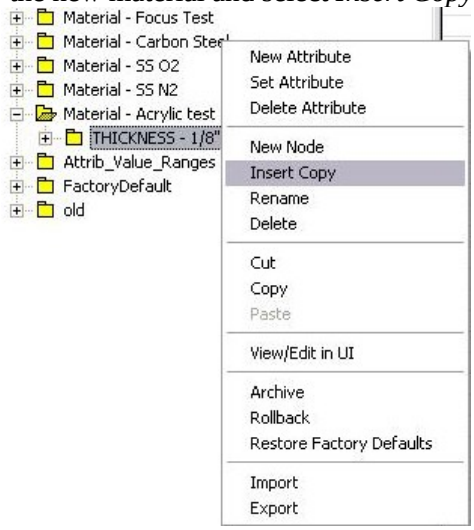


Saving the Material Thickness

1. Cancel out of the Material Library until the home screen is displayed on the keypad.

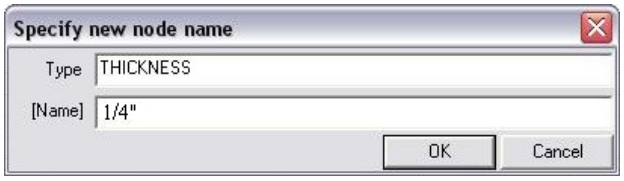
2. Open Material Library Editor. The system will automatically provide material thicknesses and attributes based on the last material added, so operators will need to update the information for the new material.

3. Right-click on any thickness under the new material and select *Insert Copy*.



This will automatically open the material attribute folder.

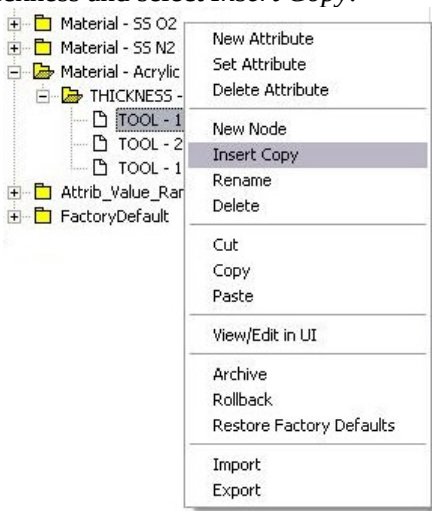
4. Change the name of the thickness if necessary (e.g., 1/8” to 1/4”) and select *OK*. Operators can use up to 6 characters for the thickness.



5. Select File >> Save. The tool information will be copied from the previous file.

Saving Tool Parameters

1. Right-click on any tool under the thickness and select *Insert Copy*.



This will automatically open the tool attribute folder.

2. Change the number of the tool (e.g., 1 to 3) and select *OK*. Operators can only modify tools 3 – 15 only since tools 1, 2, and 16 default to specific functions.

Tools 1, 2, and 16 are defined in Material Library as the following:

- Tool 1 – Cutting
- Tool 2 – Engraving
- Tool 16 – Rastering

3. Change tool attributes as needed.

4. Select File >> Save in Material Library Editor to save all the changes.

5. Select File >> Reload and close out of Material Library Editor.

Saving Material Library Information

Operators can double-check the material library information before each cut by reviewing the information available on the home screen.

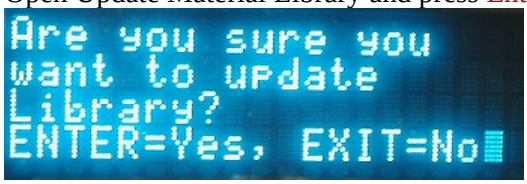
If the operator decides to make changes to the material library information currently available for that material, then he or she should complete the following:

1. Open Params_2D from the keypad.

2. Change the parameters as needed (e.g., feedrate, power, cut height).

3. Scroll down to Update Material Library.

4. Open Update Material Library and press Enter to update the information for that material.



Software

JobServer HotWatch

The HotWatch component of JobServer allows job files to be automatically transferred to the ***MultiCam*** Laser by monitoring a specified directory on the computer. Whenever a file with a known extension appears in this Inbox directory, HotWatch will transmit it to the laser and then move the file from the Inbox directory to the Outbox directory. These directories do not have to be located on the local hard drive but can exist as shared folders on a local or wide area network. HotWatch can be configured to check for new files at specified intervals to help minimize network traffic.

The full path of the Inbox and Outbox directories is displayed in the HotWatch applet, and these directories can be changed at any time by clicking on the Browse button to select another path. The HotWatch Status informs the operator of all activities that HotWatch is performing.

HotWatch does not automatically monitor the Inbox directory or transmit job files. Operators must manually set up HotWatch and activate this function. Software

JobServer JobQueue

The JobQueue component of JobServer allows jobs for production runs to be created and set up. The job file must be created and started before JobQueue will execute, and the operator can set up JobQueue in the JobQueue window. Once these settings are made and JobQueue is started, the operator will be prompted to start each job after seeing the repetition number of the job being executed. This allows the operator to move to another home position or unload and load material before the cutting sequence. Software

JobServer - Control Settings

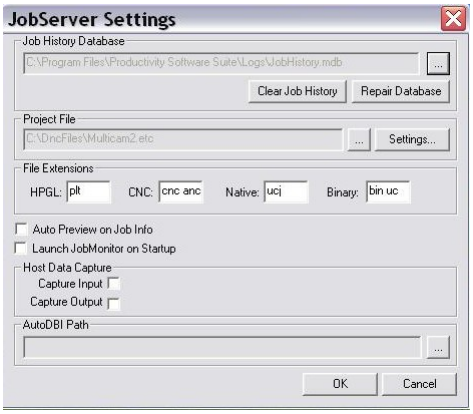
When ***MultiCam*** software is installed, JobServer's control settings will be configured for each host computer. The Machine Tools Control Panel applet is used to set up and maintain connections between the PC and the controller of the ***MultiCam*** Laser. Any current setup connection will be displayed. To edit a setup connection, the operator must highlight the connection and select *Properties*. The operator may select *Remove* to delete the entry and select *Add* to add a new connection.

In JobServer, the Machine Tool name is used on the command line to tell JobServer what machine to connect to for the proper settings. This allows JobServer to be opened more than once and communicate to a different machine.

Software

JobServer - Project Settings

The JobServer Project Settings dialog can be found by right-clicking on the JobServer icon in the Windows system tray. These settings allow the operator to set up JobServer to individual preferences as well as particular settings required by ***MultiCam***. Some of the settings are not used by every ***MultiCam*** operator, and operators can contact ***MultiCam*** Tech Support for answers if they are unsure about their requirements.



The Job History Database is used by all of the components of JobServer to record activity. When files are executed, the file name, date, start time, completion time, total job time, and final outcome of the job are all recorded in this database. Job completion, whether the job was cancelled or an error occurred, is recorded in this file. The database is in the Microsoft Access MDB format. The complete job history can be permanently removed by clicking on *Clear Job History*. When the database becomes very large and starts slowing down, operators can run maintenance on the system by clicking on *Repair Database*.

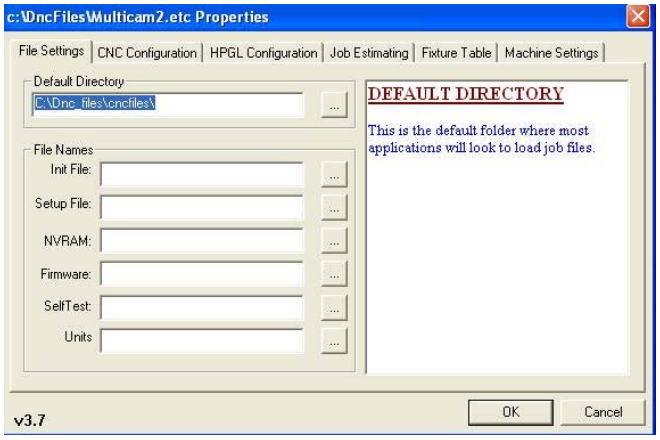
Certain information, such as M Codes and other CNC- or HPGL-specific information, is stored in Project Files. Operators can select a Project File from Program Settings. Creating a new file or changing values in an existing file can be done by selecting *Settings* next to the project file name. More information on the Project settings is provided in the MotionMechanic documentation.

File extensions that JobServer will consider as executable jobs are listed under the File Extension section. File extensions and the corresponding languages are displayed. Using DNC, the operator can view the various job files that correspond to the displayed file extensions on the display. HotWatch will only detect and run files corresponding to the displayed file extensions. Operators must enter the appropriate file extensions in the associated edit box for that language. Separating extensions with a space will specify multiple file extensions for a given language. One type of language that needs explanation is Binary. When a job is sent to the controller with the extension listed in the Binary box, the job is sent in binary format; therefore, no processing will be done with the job before it is sent. This is useful for Raster jobs, which contain binary information.

For diagnostic reasons, the RS232 Data Capture options are provided. If one of the selection boxes is checked, a file name will be requested, and the system will store data under that file name exclusively until the selection box is unchecked. This procedure should only be used for diagnostic purposes. Because these capture routines are capturing from and to a controller, the port must be available for these options to take effect. If the JobServer icon has the red line through it, then the port is unavailable, which would prevent the operator from setting these specific options. Software

File Settings

The File Settings function of the PSS Project Settings allows the operator to search through files and folders on the system to locate specific job files and extensions after identifying the Default Directory and selecting the file name. If the Project Settings option is selected without a project open, the Open Project dialog box will open and prompt the operator to select a project before beginning the cutting sequence. At this point, the operator may select the Project Settings option and proceed with the job file.



A. Default Directory displays the path currently specified for the application to follow when searching for files with the .uc extension. The operator can browse the drive(s) of the host PC to locate the appropriate directory with the Browse button to the right of the edit box ... . Once the correct path has been determined and the appropriate directory has been located, the operator may select *OK*.

B. File Names consists of several edit boxes, each specifying the path and file name of the appropriate file. The operator can browse the drive(s) of the host PC to locate the appropriate directory with the Browse button to the right of the edit box ... . Once the correct path has been determined and the correct file is displayed in the dialog box, the operator can either highlight the file of interest and select *Open* or double-click the file to open it automatically.

1. *Init File* of extension .uc is the initialization file of the application.

2. *Setup File* is of extension .htm.

3. *NVRAM* is of extension .uc.

4. *Firmware* of extension .bin is the application interpreter with the controller with files written in assembler language.

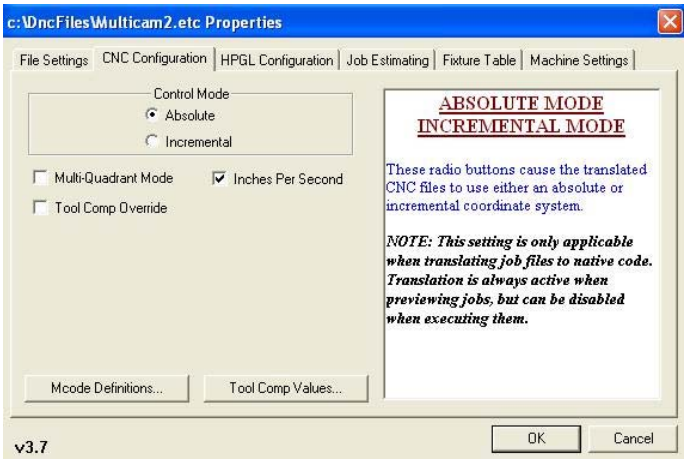
5. *SelfTest* is of extension .uc, .ini, .txt.

6. *Units* is of extension .uc, .ini, .txt.

Software

CNC Configuration

PSS Project Settings offer several different modes for working with G and M Codes. If the Project Settings option is selected without a project open, the Open Project dialog box will open and prompt the operator to select a project before beginning the cutting sequence. At this point, the operator may select the Project Settings option and proceed with the job file.



The operator must select absolute or incremental control mode to begin the cutting sequence. Additional classifications and parameters can be set once the control mode is defined.

A. Control Mode

1. Absolute mode (G90) instructs the controller system to determine measurements from the established Soft Home.

2. Incremental or relative mode (G91) instructs the controller system to determine measurements from the last tool position.

B. Multi-Quadrant Mode refers to G74 (multi-quadrant mode off) and G75 (multi-quadrant mode on) codes. When this option is checked, the controller will function in multi-quadrant mode. When this option is unchecked, the controller will function in single-quadrant mode.

C. Mcode Definitions

1. *Add* opens a dialog box with several combination boxes, allowing the operator to establish an M-Code definition with several parts.

2. *Mcode* shows the code designation.

3. *Device* designates a numeric value for each associated tool.

4. *State* indicates whether the system is active (with tool engaged) or inactive (with tool disengaged).

5. *Graphic* indicates either Yes (the sequence typically follows a tool function) or No (the sequence follows non-tool functions).

6. *Edit* allows the operator to edit or modify existing M-Code definitions by selecting the M Code of interest and modifying the information.

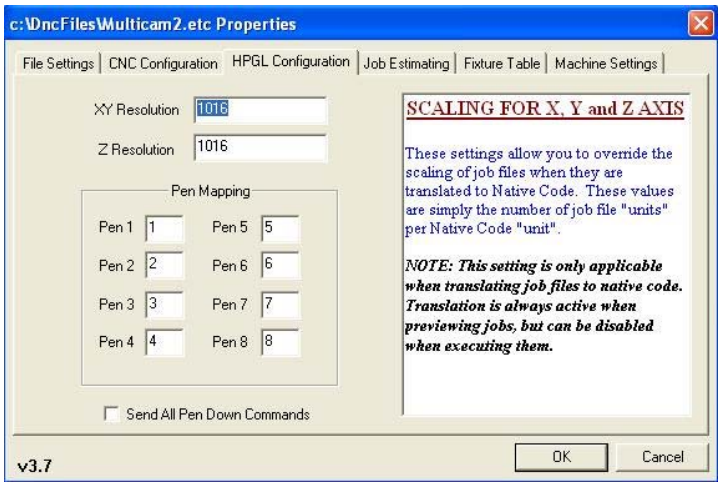
7. *Delete* allows the operator to remove an existing M-Code definition by selecting the M Code of interest and deleting the information.

D. Tool Comp Values allow operators to preview jobs and can be used instead of flash parameters when JobPreviewer is run without a controller or without MotionMechanic being installed. Tool Comp Values match the parameters of the job file. Each tool has its own tool compensation distance, and up to 10 values can be set to compensate for the tool width when cuts are being made. Software

HPGL Configuration

The HPGL Configuration screen is set up for inches with a resolution setting of 1016. This configures the controller for a 1" to 1" scale. Operators using metric units should set the resolution to 40.

The resolution should be checked when the part size is different from the programmed part size. The white box to the right of the settings provides additional information and help for whichever function is selected.



Software

HPGL Command Support

The ***MultiCam*** control system internally translates HPGL. Feedrate, Cut Height, and Lift Height can be set by the file or by the machine's keypad interface. If the Feedrate, Cut Height, and Lift Height are set at the machine prior to the file being sent, the file will override all those values set at the machine. If no value is sent in the file, then the machine will use the value programmed at the keypad. The control system ignores the HPGL VS command.

At the beginning of the file, the controller **must** be sent the IN command to begin processing plot commands. If the letter I is **not** the first character sent, then a linefeed or semi-colon must be sent to re-initiate the sequence. A semi-colon must follow the IN command. If any other character is sent during this sequence, then the complete sequence must be restarted. This command sequence must be sent again if an SP or an SP0 command is sent. The recommended initialization string is ";IN;" and the recommended termination string is "SP0;". All files should be written in absolute mode. Some of the early systems do not support relative arc commands.

HPGL Resolution = 1016 inch =40 Metric

The following pages contain all of the supported commands. A semi-colon or a linefeed **must** terminate all commands, and spaces **cannot** be substituted for required commas in the syntax of a command. All Z-axis arguments are only valid if the 3D mode is set. All commands are integers unless otherwise specified.

Help documents on the HPGL and CNC systems are located in the ***MultiCam*** folder, and operators can access this folder through either Start/Programs/Multicam/Help/Translated PLT Help or Start/Programs/ Multicam/Help/Translated CNC Help.

Example Files

Multi Tool File

```
;IN;PU;ZZ0;
PA0,0;
TCTool 1;
ZD127;ZU400;
PA1016,1016;PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
PU;TCTool 2;
ZD127;ZU400;
PA2032,2032;PD2032,2032;PD10160,2032;
PD10160,10160;PD2032,10160;PD2032,2032;
PU;TCTool 3;
ZD127;ZU400;
PA3048,3048;PD3048,3048;PD9144,3048;
PD9144,9144;PD3048,9144;PD3048,3048;
PU;PA0,0;
SP0;
```

Automatic Tool Changer File (or Multi Head)

```
;IN;PU;ZZ0;
PA0,0;
SP3;
ZD127;ZU400;
PA1016,1016;PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
PU;SP1;
ZD127;ZU400;
PA2032,2032;PD2032,2032;PD10160,2032;
PD10160,10160;PD2032,10160;PD2032,2032;
PU;SP2;
ZD127;ZU400;
PA3048,3048;PD3048,3048;PD9144,3048;
PD9144,9144;PD3048,9144;PD3048,3048;
PU;PA0,0;
SP0;
```

Arc File

```
;IN;ZZ0;SP1;
PA1360,2450;ZD0.500000;PD;
AA1270,2540,360.000000;PU;
PA2010,3048;PD;PA1292,3766;PU;
PA2630,3720;PD;AA2540,3810,360.000000;
PU;PA3290,4263;PD;PU;PA4154,3720;
PD;AA4064,3810,360.000000;
PU;PA4902,4263;PD;PU;PA5678,3720;
PD;AA5588,3810,360.000000;PU;
PA4064,2921;PD;PA2540,2921;
AA2540,2540,180.000000;PA5588,2159;
AA5588,2540,180.000000;PA4064,2921;
PU;PA4154,1180;PD;AA4064,1270,360.000000;
PU;PA5678,1180;PD;AA5588,1270,360.000000;
PU;PA6948,2450;PD;AA6858,2540,360.000000;
PU;PA2630,1180;PD;AA2540,1270,360.000000;
PU;PA7747,2540;PD;AA5588,2540,-90.000000;
PA2540,381;AA2540,2540,-
180.000000;PA5588,4699;
AA5588,2540,-90.000000;PU;PA8128,0;SP0;
```

Sample 3D file

```
IN;ZZ1;PU;SP1;
PA5000,5000,-200;
PD5000,5000,500;
PA5000,15000,1000;
AA10000,15000,-180;
PA15000,5000,750;
AA10000,5000,-180;
PA5000,5000,-200;
PU;SP0;
```

Multi Pass File without Lifting the Z

```
;IN;PU;
PA0,0;
SP1;
ZD100;
PA1016,1016;
PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
ZD200;
PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
ZD300;
PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
ZD400;
PD1016,1016;PD11176,1016;
PD11176,11176;PD1016,11176;PD1016,1016;
PU;SP0;
```

Software

HPGL Commands

Initilization

IN instructs the controller to begin processing the HPGL plot file. Without this, the commands in the file are received but never executed. If multiple IN commands are found during the execution of the file, the controller performs a Pause/Cancel operation. All motion from the previous job that has yet to be executed is lost, and the new information is executed. When the IN command is executed, the HPGL 3D mode is cleared. The 3D mode can be reset using the ZZ command. A PU command will be executed before the system executes the first HPGL move command.

ZZ (0,1) establishes that a value of 0 sets 2D mode and a value of 1 sets 3D mode. In 2D mode, all commands must have 2 axes, while all commands must have 3 axes in 3D mode.

Motion

PA[X,Y][,Z] moves to an absolute HPGL position and sets absolute mode for future PU and PD commands. If no arguments follow the command, only absolute mode is set.

PD[X,Y][,Z] executes a Pen Down then moves to the requested position, if one is specified. This position is dependent on whether absolute or relative mode is set. The Feedrate Override knob is turned ON.

PU[X,Y][,Z] executes a Pen Up then moves to the requested position, if one is specified. This position is dependent on whether absolute or relative mode is set. The Feedrate Override knob is turned OFF.

AA X Ctr,Y Ctr,Angle is a floating point requiring a non-integer value that draws an arc with its center at X,Y. A positive angle creates a counter-clockwise arc.

ZA Z moves the Z-axis to the absolute position specified. This feature is for both 2D and 3D modes.

Speed

SF[XY-rate],[Z-rate], floating points, sets the feedrate for the machine tool during Pen Down. All rates are in mm/sec. The Z rate applies to the plunging feed rate of the Z-axis. In 3D mode, the Z-axis rate is not used.

Other

SP[0, 1, 2, ..., 8...] selects a new tool for use. If zero or no pen number is given, the controller performs an end of file command (EOF). Once an EOF is performed, no motion is executed until a new IN command is received. Pens 1—8 are spindles, and pens 11—12 are drills.

ZD Z, floating point, sets the distance from the surface for the Z-axis to move down on a PD command (Depth). Changing the ZD value will change the depth on all following PD commands. The value set with this command is **not** used when running in 3D mode.

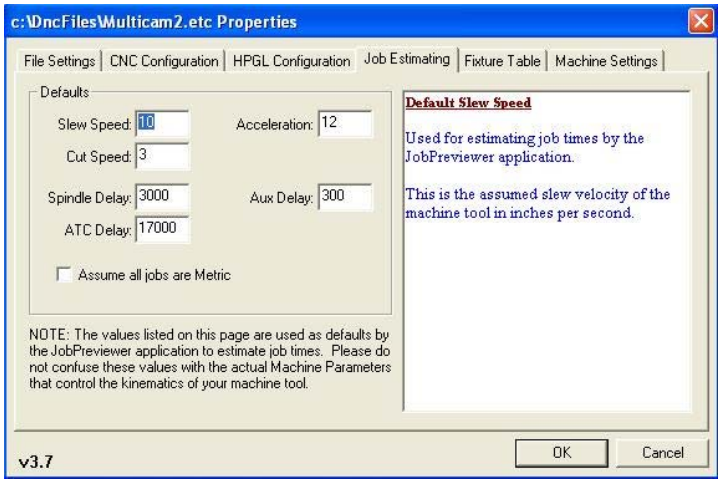
ZU Z, floating point, sets the distance from the surface for the Z-axis to move up on a PU command (Tool Lift). Changing the ZU value will change the lift distance on all following PU commands. The value set with this command is **not** used when running in 3D mode.

TC [text] issues a tool change command. The text following the TC command will appear on the keypad display at the appropriate time in the tool change sequence. The operator will have the ability to surface the new tool, change speeds, depths, and the lift. If this information is going to be set by the file, the appropriate commands must be sent after the tool change command. Software

Job Estimating

The Job Estimating screen provides operators with a place to enter values for the JobPreviewer function to use when estimating Job times. **These settings have no effect on the actual machine operation**.

The White box to the right of the settings provides help for whichever function is selected.


c:\DncFiles\Multicam2.etc Properties
File Settings
CNC Configuration
HPGL Configuration
Job Estimating
Fixture Table
Machine Settings
Defaults
Slew Speed: 10
Acceleration: 12
Cut Speed: 3
Spindle Delay: 3000
Aux Delay: 300
ATC Delay: 17000
Assume all jobs are Metric
NOTE: The values listed on this page are used as defaults by the JobPreviewer application to estimate job times. Please do not confuse these values with the actual Machine Parameters that control the kinematics of your machine tool.
Default Slew Speed
Used for estimating job times by the JobPreviewer application.
This is the assumed slew velocity of the machine tool in inches per second.
v3.7
OK
Cancel

Software

MultiCam M- and G-Code Support

The following table lists the supported G and M Codes for the *MultiCam* Controller. Parameters within brackets are optional. The fields represented by "d.d" may be any decimal number, and fields represented by "d" may be any positive integer. All lines of machine code must start with either an M Code or a G Code.

G00 [Xd.d] [Yd.d] [Zd.d] [Fd.d] [Td] [Ctext string] - High speed move (slew)
G01 [Xd.d] [Yd.d] [Zd.d] [Fd.d] - Linear move (machine)
G02 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d] - CW 2D circular move
G03 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d] - CCW 2D circular move
G04 Fd.d - Dwell (seconds)
G17 - Specify XY plane for helical
G18 - Specify ZX plane for helical
G19 - Specify YZ plane for helical
G37 - Find home
G62 - Clear soft home
G70 - English programming (inches)
G71 - Metric programming (mm)
G72 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d] - CW 3D circular move
G73 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d] - CCW 3D circular move
G74 - Incremental mode for G02/03 arcs
G75 - (G90/G91) mode for G02/03 arcs
G83 Rd.d Zd.d Dd.d [Fd.d] - Peck drill
G90 - Absolute coordinate mode
G91 - Incremental coordinate mode
G92 [Xd.d] [Yd.d] [Zd.d] - Set soft home
G97 Sd - Set spindle speed (rpm)
M00 - Program pause
M01 - Optional pause
M02 - Program end
M11 - 2D device on (like HPGL PD)
M21 - 2D device off (like HPGL PU)
M12 - 3D device on
M22 - 3D device off
M30 - AUX 4 on not affected by the Pause button
M31 - AUX 4off not affected by the Pause button
M90 - Program start
M99 - Exit CNC interpreter

The following table lists the letters used to denote various arguments in ETC CNC version 1.0.
C - Tool change operator message (used in G00)
D - Peck drill delta (used in G83)
F - Feed rate (used in G00, G01, G02, G03, G72, G73, G83)
F - Dwell (used in G04)
G - Preparatory function
I - Circular interpolation value in X dimension (used in G02, G03, G72, G73)
J - Circular interpolation value in Y dimension (used in G02, G03, G72, G73)
K - Circular interpolation value in Z dimension (used in G02, G03, G72, G73)
M - Miscellaneous function (control function)

N - Sequence number
R - Beginning Z motion dimension (used in G83)
S - Head Assembly RPM (used in G97)
T - Tool change (used in G00)
X - X motion dimension
Y - Y motion dimension
Z - Z motion dimension

The following is a 5” square with a rapid level of 0.5” above the material, feed down at 100 ipm, cut feed at 200 ipm, rapid down to 0.1” above the material, and a cut depth of 0.25”.

```
M90
G90
G70
G75
G00 T1
G00 Z-0.5
G00 X0. Y0.
M12
G00 Z-0.1
G01 Z0.25 F1.667
G01 X5. F3.333
G01 Y5.
G01 X0.
G01 Y0.
G00 Z-0.5
M22
G00 X0. Y0.
M02
```

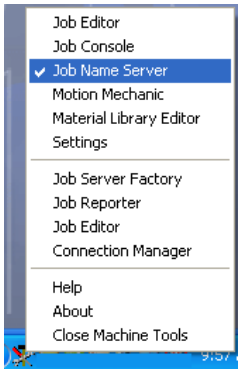
The following is a 5” circle clockwise, with a center at 2.5,2.5, rapid level of 0.5”, feed down at 60 ipm, cut feed at 120 ipm, rapid down to 0.1”, and a cut depth of 0.4”.

```
M90
G90
G70
G75
G00 C1/2”bit
G97 S18000
G00 Z-0.5
G00 X2.5 Y2.5
M12
G00 Z-0.1
G01 Z0.4 F1.
G02 I2.5 J2.5 F2.
G00 Z-0.5
M22
G00 X0. Y0.
M02
```

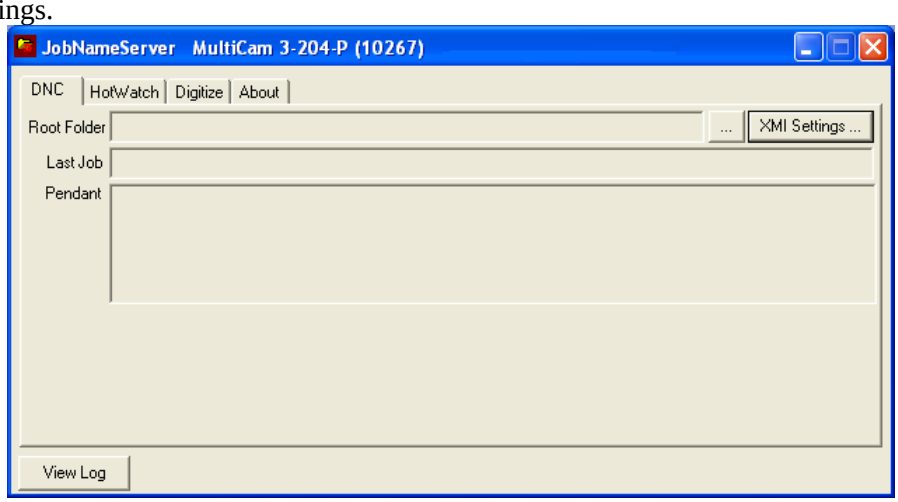
Mapping M Code to Output

Operators can add M Codes to an output on their existing machines, assign the code to a particular device, and set the active status by completing the following steps:

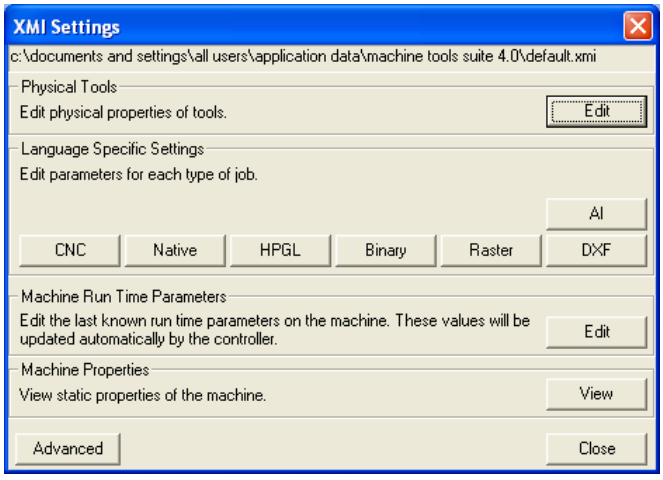
1. Open MachineTools and select JobNameServer.



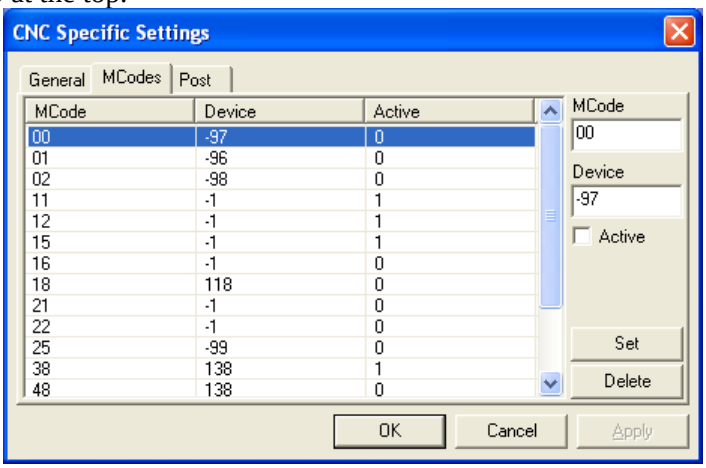
2. Select XMI Settings.



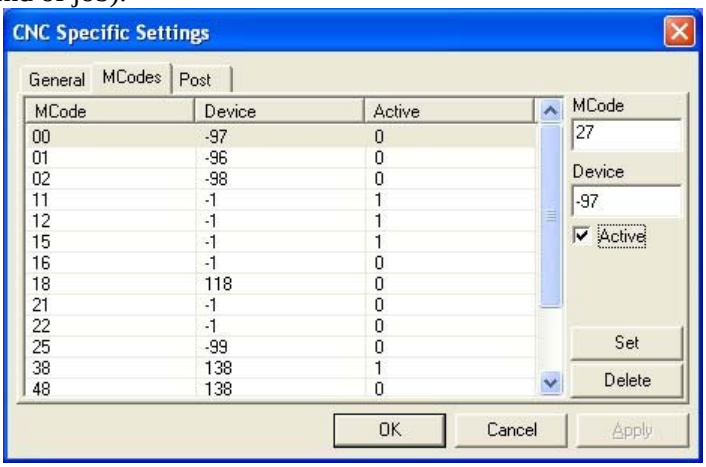
3. Select CNC.



4. Click on the MCodes tab at the top.



5. Enter the M Code (e.g., 27), correct the device as needed, set the status to Active by clicking in the check box, and select *Set*. **Active** indicates a motion command (e.g., start spindle) while **Inactive** indicates a non-motion command (e.g., end of job).



Any M Code, including M12, can be mapped per the operator's preference; however, JobConsole treats the M12/M22 coding specifically for the start/end of a contour.

6. Download and store an MCode_Device_Map.uc file to location 3. For assistance on any of these steps, please contact ***MultiCam*** Tech Support.

Operators may also modify or delete M Codes from this same dialog.

Modify - Highlight an existing M Code, make changes (e.g., Device -1 instead of -97), and select *Set*.

Delete - Highlight an existing M Code and select *Delete*.

Software

Glossary

The following words are most commonly used in reference to the laser and associated activities.

Acrylic - A type of plastic, or a common material used in sign making.

Aperture - Any opening in the protective housing or enclosure of a laser that releases collateral radiation.

Axis - A direction in a coordinate system. ***MultiCam*** Lasers have 3 axes: X, Y, and Z.

Axis Motor - A motor that causes motion in a particular axis.

Bar Code Scanner - A device that allows operators to retrieve information encoded in a bar code label so that specific notes and directions are kept in line with the correct job file.

Bearing Car - The bearing on which an axis moves along a rail, also known as a bearing truck. There are 2 bearing cars for each rail.

Bearing Rail - The rail on which the bearing cars ride. There are 2 rails for each axis.

Bevel - The angularity between the material surface and the cut edge.

Bite Size - The depth of each pass, used in multipass.

Class I - The lowest level for lasers. Class I Lasers are not considered to emit hazardous radiation.

Class IV - The highest level for lasers. Class IV Lasers are hazardous to eyes, skin, and material through both direct and scattered radiation. Manufacturers of Class IV Lasers are required to follow strict guidelines regarding labeling, separating, and operating any part of these systems that falls under this classification. Operators of Class IV Lasers are strongly encouraged to observe the requirements set forth by the Federal government and their State Attorney General's office.

Climb Cut - A direction the laser moves along a cut to produce a climbing motion. For a closed contour, the climb cut is clockwise on the outside of the cut and counter-clockwise on the inside of the cut.

Collateral Radiaton - The type of radiation also emitted by a laser that is not classified as laser radiation.

Consumables - The components that are used up in the cutting process.

Conventional Cut - The opposite cut of a climb cut, or closed counter-clockwise on the outside of the cut and clockwise on the inside of the cut.

Cross-over Cable - The type of Ethernet connection that is directly connected to the computer.

Cut Conditions - The most efficient condition for standard cutting or engraving. Cut conditions change the motion parameters of the cutting system.

Cut Depth - A Hot Key function that sets the depth of cut. Cut Depth refers to the Z-axis distance the end of the cutter will go below the surface of the material during a cut.

Cut Height - The distance the cutting tip maintains above the surface of the material on a cutting move.

Cut Speed - A Hot Key function that sets the speed of the cut.

Dieline - The path taken by the cutting head to complete the cutting sequence. Dielines are most often used in software programs like Adobe Illustrator.

DNC - (Distributed Numerical Control) allows the controller to access sub-directories on the hard drive of a host PC and is used to transfer files from the PC to the controller.

DNC Log - A listing of all activity completed by the DNC and kept by the DNC.

Dry Run - A controller function that will execute a file with no Z-axis movement. Dry Run is used to show the operator where the tool will go during the cutting sequence.

Emergency Stop - The red mushroom button located on the keypad, as well as on the side of the laser on the operator station, used to remove power from the machine excluding the controller board and limit switches.

External Halt - The keypad display that appears when power is applied to the system with the Emergency Stop button pushed in on the keypad pendant.

Feedrate Override - A Hot Key used to adjust the cutting feedrate of the system while a file is being executed.

Fiducial - A reference mark, or dot, used in MultiVision that allows the CNC machine to recognize the orientation of the material and adjust the cut file accordingly.

Firmware - The operating system of the controller that should only be loaded when instructed by ***MultiCam***. Firmware contains all of the low-level commands and is the first level of controller software.

Flash RAM File - A file containing all of the machine parameters of a particular laser. Settings such as table size and resolution are located in the Flash RAM File, which is the third level of controller software.

Gantry - The mechanical part of the laser, also known as the bridge, which moves the head assembly from the front to the rear of the table.

G Code - The machine code language used by the controller to execute motion commands.

Gearbox- The drive system on Pro series that uses planetary gear reduction to produce rotation of the pinion.

Hard Home Position - The home position determined by the location of the targets and limit switches, typically the front right side of the table.

Head - A reference to the particular cutting tool (i.e. Spindle, Plasma torch, Laser, or Oxyacetylene torch).

Head Mode - A designation for multiple head machines, either All or Auto.

Height - The distance between the gas jet tip and the workpiece.

Height Offset - An externally selected deviation either above or below the set point.

Height Set - The selected distance between the gas jet tip and the workpiece.

Hot Keys - The one-touch keys on the keypad that perform controller functions.

HPGL - The machine code language that the system executes as a file.

Human Access - The capacity for operators and all other personnel to encounter laser or collateral radiation on any part of their bodies through direct or deflected beams.

Init File - The second level controller software that contains high level commands.

JobServer - The motion controller utility program used to communicate between the controller and the host PC.

JobNameServer - The motion controller utility program used to communicate between the controller and the host PC in Suite4.

Kerf - The width of the cut.

Keypad - The part of the pendant with the grid of Hot Keys.

Laser - Light Amplification by Stimulated Emission of Radiation. Lasers can be classified based on the level of laser and collateral radiation with Class I as the lowest classification and Class IV as the highest classification.

Laser Radiation - All electromagnetic radiation emitted by the laser.

Lift Height - The Z-axis distance between the bottom of the laser and the material. The Lift Height is also the location of the laser during a slew move.

Light Curtain - A boundary around the machine created by parallel, infrared light beams that stops the cutting sequence once an object or person crosses the beams.

Machine Parameters Menu - A tool of the ***MultiCam*** Productivity Software Suite that allows the flash RAM file to be modified.

Menu System - The commands that are not assigned to Hot Keys.

Node - A computer or device that is connected to a Class C or Private network, which is common in most businesses.

Operator Station - The stand-alone board separate from the machine and keypad that allows the operator to turn on auxiliary systems or access dual systems if applicable.

Park - The function used in all 3 axes to place the head assembly at the farthest point away from the material for loading and unloading.

Patch Cable - The type of Ethernet connection that is connected to the computer through a networking component such as a hub, switch, or router.

Pause - The yellow button on the keypad that puts the controller into Pause mode where action is momentarily stopped and can be restarted at the keypad.

Pendant - The control module consisting of the keypad and mechanical inputs.

Programmable Soft Home - The 9 possible home positions that the operator can store to be recalled at a later time.

Protective Housing - The covers on the laser that prevent human access to excessive amounts of laser and collateral radiation.

Proximity Restart - The controller function that allows the operator to restart a file along any cut move after an interruption such as power outage or tool breakage.

PSS - The ***MultiCam*** Productivity Software Suite (formerly the Router Productivity Suite, {RPS}). This software provides the interface between the computer and the laser.

Rack and Pinion - A system of transferring movement from the rotation of the motors to the linear movement of the system by way of gears.

Raster - A scan pattern of dots to form an image (as of the print head in a printer) in which an area is scanned from side to side in lines from top to bottom or bottom to top and each dot is a laser pulse. The laser pulse power of each dot is determined by either a laser power setting for bitmap images where the black dot is pulsed at the power setting and white is given no power or by the grayscale value in grayscale images where a gray scale value of 0 (black) is at the power setting and a gray scale value of 255 (white) is no power. All values in-between are scaled accordingly.

RPS - The ***MultiCam*** Router Productivity Suite, now referred to as the Productivity Software Suite (PSS).

Sacrifice Material - The material that is placed between the tabletop and the material being cut, also known as spoil board. The sacrifice material is used to protect the table surface and is considered a consumable item.

Self Test - A controller function that allows the system to test itself. The self test is accessed from the menu items.

Serial Cable - The RS232 cable used to transfer data from the host PC to the controller.

Servo Drive - The Servo amplifier used to move the servo motors.

Servo Motor - The axis motor on a servo system.

Side Cover - The covers on each end of the gantry protecting the X-axis motor and limit switches.

Slew - A non-cutting movement of the system above the material at maximum speed.

Soft Home Position - Any set home position used as the origin for executing programs.

Spoil Board - The material that is placed between the tabletop and the material being cut, also known as sacrifice material. The spoil board is used to protect the table surface and is considered a consumable item.

Stepper Drive - An amplifier that controls the action of the stepper motors.

Stepper Motor - An axis motor that uses stepper technology.

Surface - The topside of the material used as the Z-axis reference point.

Tip Contact - The connection made between the gas jet tip or tip retainer and the workpiece.

Tip Standoff - The distance between the gas jet tip and the workpiece.

Tool Offset - The distance between the center of the laser and the cutting edge. The Tool Offset is also the distance between the desired geometry and the center of the tool path, usually the radius of the laser.

Tool Path - The path that the center of the laser takes during a cut.

Transmission - The drive system on SF series using a 4:1 belt drive pulley system to produce rotation of the pinion.

uCito - The native language of the controller (pronounced micro-see-tow).

Vector - A line segment showing a particular direction or path.

Workpiece - A grounded conducting material that can be drilled or cut by the laser.

X-axis - The axis that refers to the length of the table, front to back.

X Motor Plate - The plate attached to the side of the gantry in which the transmission or gearbox assemblies are bolted.

Y-axis - The axis that refers to the width of the table, left to right.

Y Carriage Plate - The vertical plate behind the Z-axis carriage plate where Z-axis bearing rails are mounted.

Y Motor Plate - The horizontal plate attached to the Y-carriage plate where the Y-axis transmission or gearbox assemblies are bolted.

Z-axis - The axis that refers to the accessible range of the area above the table.

Z Carriage Plate - The vertical plate on the vertical moving part of the carriage assembly where the cutting tool plate is mounted.

Z Motor Plate - The horizontal plate on top of the Y-carriage plate where the Z-axis motor is mounted.

Z Speed - The vertical speed of the head assembly or the plunging speed.

Software